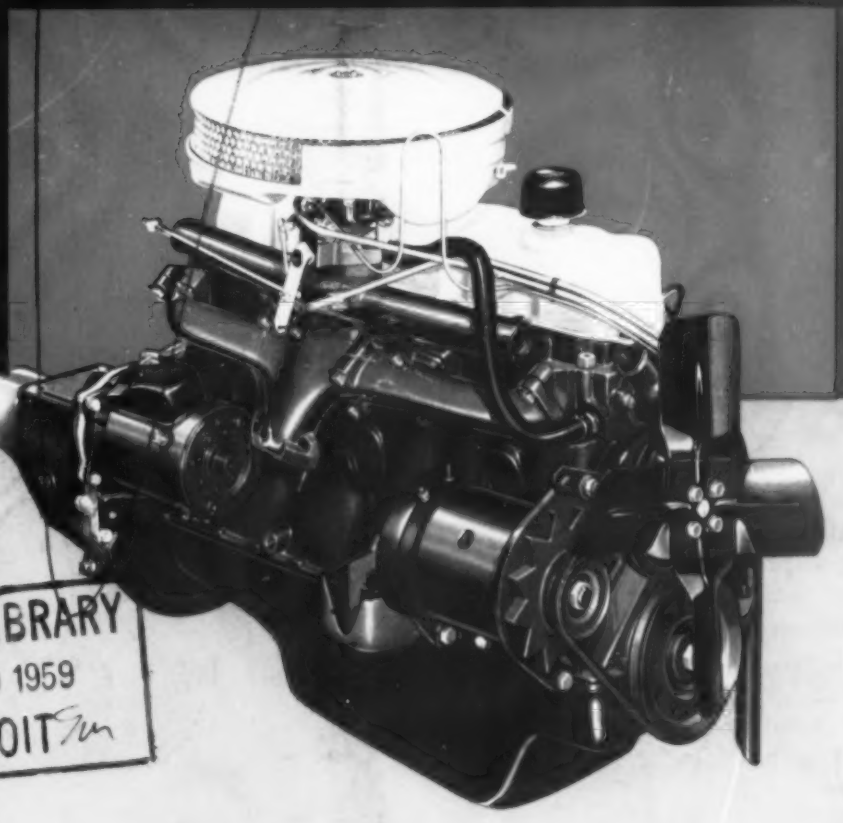
TECHNOLOGY DEPARTMENT

GRINDING and FINISHING

OCTOBER · 1959

How FORD Grinds and Hones FALCON Engines



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IN THIS ISSUE:

How to Apply Safety to Portable Grinding
What You Should Know About Wheel Manufacturing – Part II
Gaging for Grinding – Part III

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for fast, free-cutting...high production...long wheel life

SIMONDS WHEELS FOR CENTERLESS GRINDING

"Ground 70,000 pieces compared to 45,000." "Held corners and shape better than wheels previously used." "Entirely satisfactory. Gave excellent finish." These comments from users* are some reasons why Simonds Centerless Wheels are rated superior for job-to-job dependability . . . and good reasons why *your* way to accurate, lower cost centerless grinding may lie in switching to Simonds Wheels. Write for bulletin ESA 55.

*Names on request.

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Rubber bonded feed wheels exceptionally long wearing and have good traction . . . perfect mate for the Simonds Grinding Wheel.

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Job-proved Grain and Grade Specifications for all materials. Karvit bushed non-metallic center hole for better mounting and balance.

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WHEREVER ABRASIVE OPERATIONS ARE PERFORMED

GRINDING and FINISHING

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Special to GRINDING and FINISHING.

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OCTOBER COVER: Shown on this cover is the new Ford small car, The Falcon. Upper right is the Falcon four door model. Surrounding the engine are honing tools, outline of the camshaft and an outline of a connecting rod.

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the NEW *Roto-Finish* VIBRATRON®...

THE *COMPLEX* FINISHING JOBS IT DOES...
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the profitable way to precision, mass production finishing

ROTO FINISH

In the Vibratron, complex parts with shielded and hard-to-reach internal surfaces can be precision finished *mechanically* ending costly hand operations. *All* surfaces of the part are exposed to abrasive action *all* of the time. Time cycles are cut 300%, 500%, even more; so media and compound costs go down too!

Equally important, the Vibratron puts an end to manual handling of parts and media. A built-in, removable, double-decked vibrating separator separates parts and media, as well as fragments from the media in one simple operation. There's no need for an extra separator.

The Vibratron is simple in design. Uses standard, *tested* components which require minimum maintenance. Power requirements are low. Fixturing is easy because of the open tank design. Another advantage . . . noise level is at a low hum. The machine need not be bolted down.

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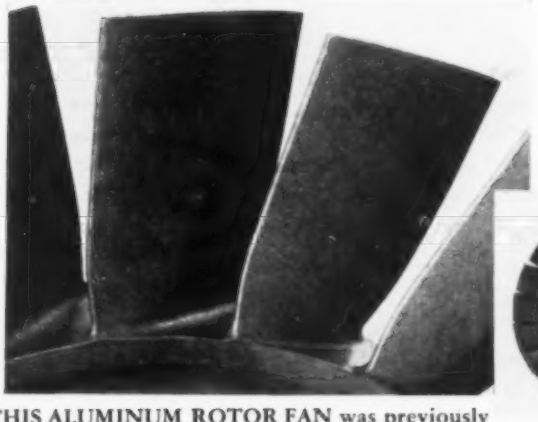
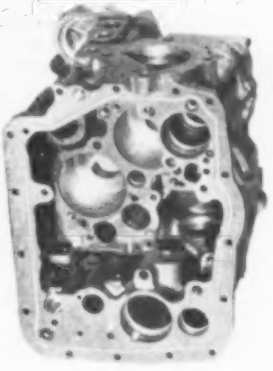
NOW THERE'S NO NEED FOR HAND FINISHING OPERATIONS ON PARTS LIKE THESE . . .

The above diagram shows how the Vibratron work zone extends throughout the abrasive mass. Every part is subject to a constant abrasive action.



THIS ALUMINUM ROTOR FAN was previously deburred, and *still* surface irregularities were not removed. IN THE VIBRATRON they are fixtured 10 parts per machine. Time cycle: one hour. No hand work required. Surface greatly improved.



Before Vibratron processing this aluminum sand casting (shown above) was hand deburred, then tumbled into a multiple compartment machine for 30 minutes. IN THE VIBRATRON it is processed 4 parts to a machine. Time cycle: 15 minutes. No hand operations required. Finish is far more uniform.

It took two belting operations *and* 20 hours of tumbling to blend in grinding lines on these forged shears, still parts were sometimes distorted during processing. THE VIBRATRON time cycle is 6 hours. No hand work required. No part distortion.

This complex business machine part previously required hand deburring because barrel finishing bent the parts. IN THE VIBRATRON 100 parts are completely deburred in a 30 minute cycle.

With the Vibratron . . . you can clean, descale, deburr, form radii, fine-finish and color stamped, cast, forged and machine parts, finish them faster . . . better . . . and more economically.

LET US PROVE IT TO YOU

Send a few unfinished parts to us . . . and a finished part to use as a guide. *We will process them for you and guarantee the same results in your plant as we get in our finishing laboratory.*

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☐ My parts are on the way to you.

☐ Please have Roto-Finish factory representative call for an analysis of my finishing problem.

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Company _____

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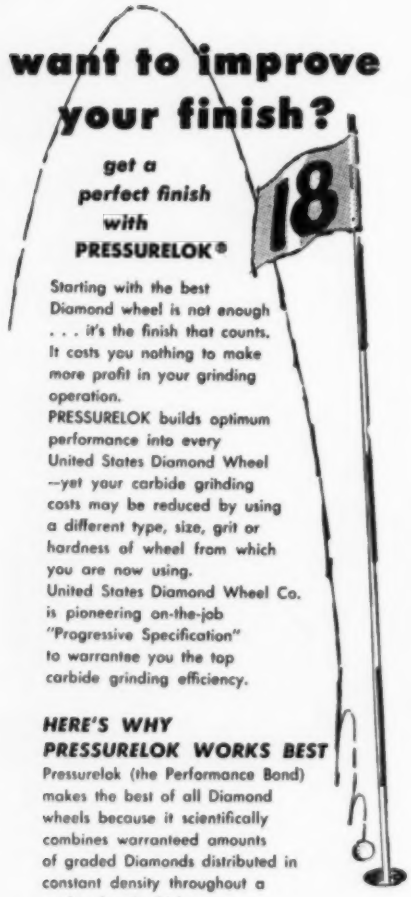
Starting with the best Diamond wheel is not enough . . . it's the finish that counts. It costs you nothing to make more profit in your grinding operation.
PRESSURELOK builds optimum performance into every United States Diamond Wheel —yet your carbide grinding costs may be reduced by using a different type, size, grit or hardness of wheel from which you are now using.
United States Diamond Wheel Co. is pioneering on-the-job "Progressive Specification" to warrantee you the top carbide grinding efficiency.



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Pressurelok (the Performance Bond) makes the best of all Diamond wheels because it scientifically combines warranteed amounts of graded Diamonds distributed in constant density throughout a perfect bond which wears uniformally at the ideal rate of Diamond usage.

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This wheel is a precise duplication of your specification, warranteed when properly operated, to give you the lowest cost per cut of any wheel.

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Editor's Mail

Safety Films, Literature

We are interested in your magazine and wonder whether you could mail us a copy for perusal. The National Safety Council Safety News has on occasion quoted articles from your publication.

We are also interested in learning whether any abrasive manufacturers produce films or literature on the proper use of abrasives. We were interested in this as training for some of our maintenance crew.

B. Lukas
Ass't. Personnel and Safety Supervisor
British Columbia Forest Products Limited
Crofton, B. C.

Standard Time Data

Recently I have had occasion to read several articles taken from your publication, on Grinding and Finishing. I found them very interesting and quite helpful.

"Developing Standard Time Data for Grinding Operations" was of most interest to me. If at all possible, I would like a copy of the above article and any similar articles.

I am presently working on Production Cost Reduction and feel the above article should be in my time data file.

Thad Treciak
N. A. Woodworth Co.
Detroit, Mich.

We are very happy to send reprints of the Standard Time Data articles. And we are pleased that they are interesting and helpful. Most of the articles in Grinding and Finishing have been reprinted. Some, such as the subject article, involve a nominal cost, while many are free on request.

A note of interest. The Standard Time Data series will soon be brought up to date and appear again.

Gaging

The first article of Mr. McKee's forthcoming series on gaging has been the subject of many favorable comments among our staff, both Engineering and Sales. I would like personally to compliment Mr. McKee and his associates for a treatment of this important subject which has been long overdue.

The treatment and content of Mr. McKee's first article indicates to me that the complete series will be a very valuable aid for the initial training of sales and engineering personnel whose previous experience has been in other, although allied, lines.

R. B. Schofield
Airborne Instruments Lab.
Mineola, N.Y.

Thank you. We sincerely hope the following parts of this series have been just as valuable.

ASA

For the benefit of recent subscribers such as myself, could you publish a short resumè of the necessary procedures in organizing a local chapter in the American Society for Abrasives and the requirements for charter application? Also, is this primarily an association for manufacturers or users?

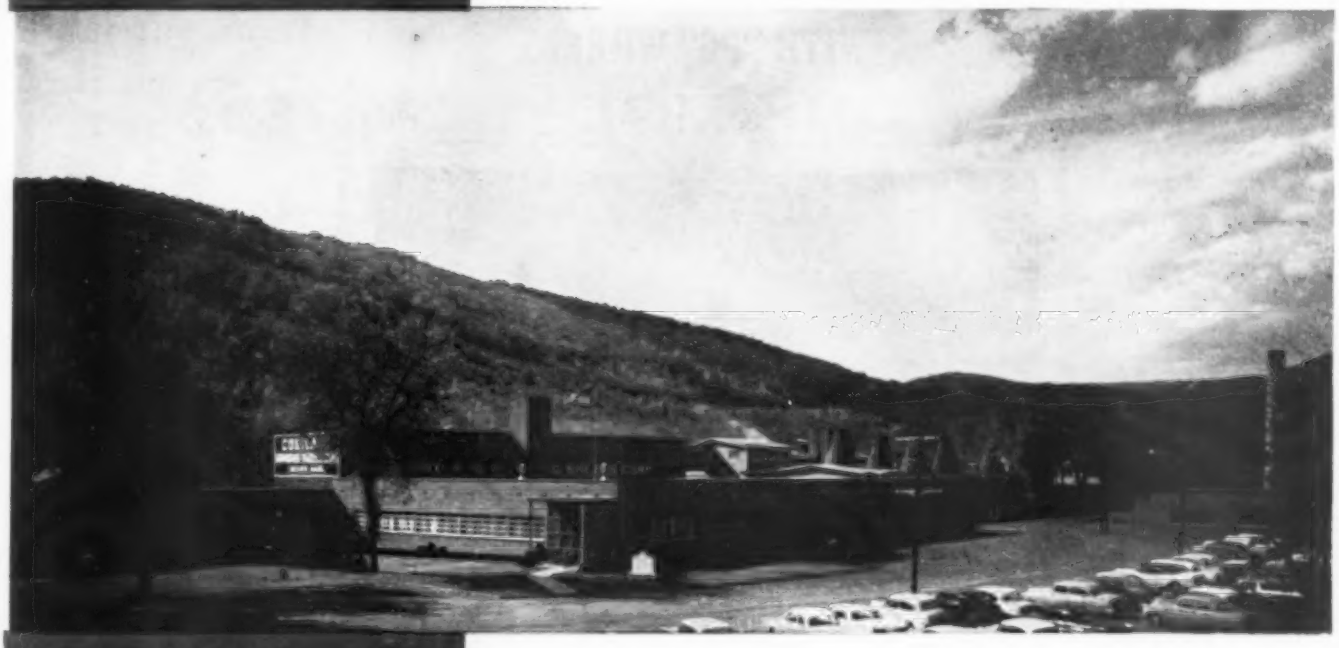
I assume your magazine has been primarily responsible for the establishment of this society.

Clifford L. Herzig
Albertson & Company
Le Mars, Iowa

Thank you! Information on organizing a local chapter of ASA can best be obtained by writing:
American Society for Abrasives, 222 Berks County Trust Bldg., Reading, Pa.
Att. Jan L. Deelman
Secretary and General Counsel
Membership is open to user, distributor or manufacturer.

Mr. Herzig, Grinding and Finishing is not responsible for the establishment of ASA, but our goals are the same. Thank you for the tribute.

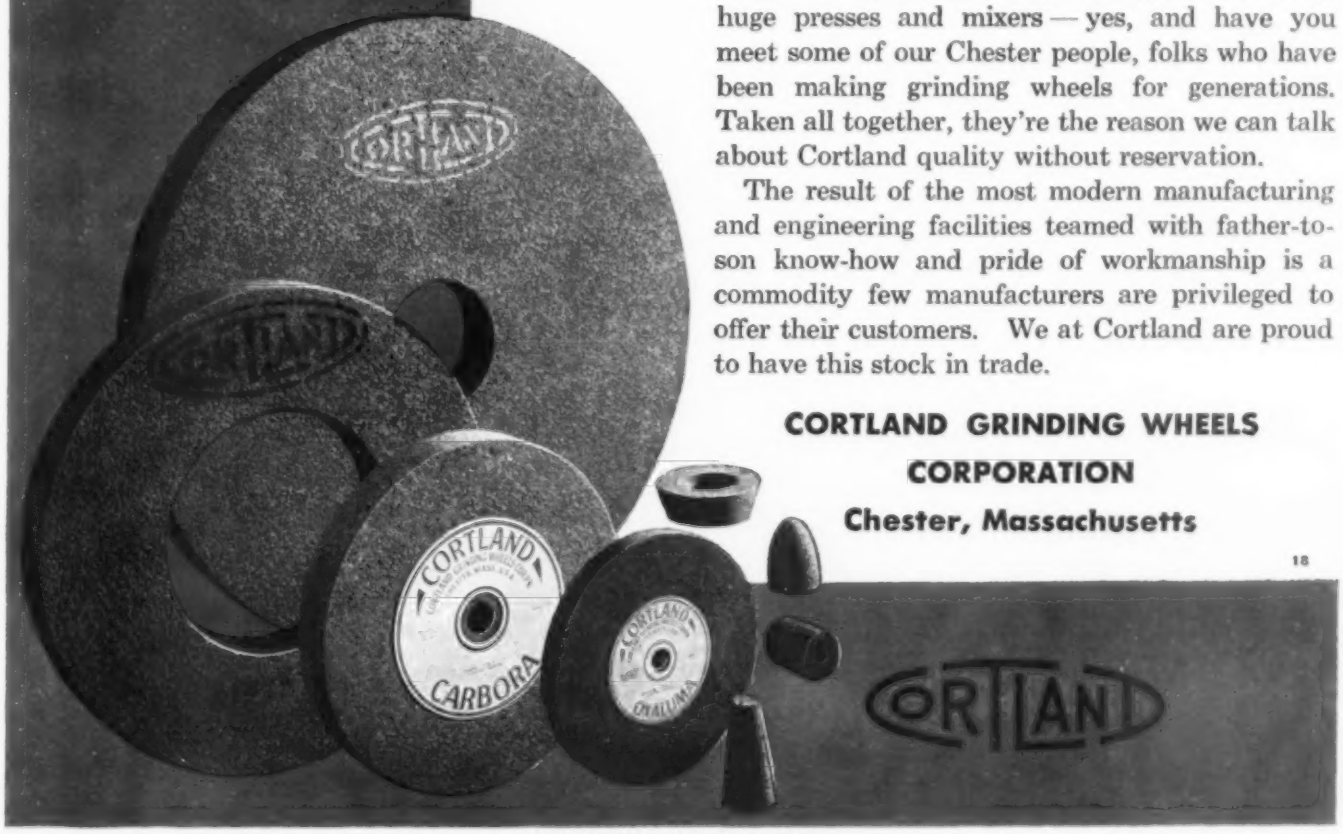
This is a black-and-white reproduction of a full-color photograph of our plant, taken at the height of the lovely Fall foliage season. Each year at this time, thousands upon thousands of beauty seekers, many with cameras, travel the roads of the Berkshires to enjoy the crisp Autumn air and to marvel at and record this richest of nature's displays.



If you're ever in Chester . . .

You'll like our placid Berkshire Hills community. And we'll be proud to show you our modern grinding wheels plant, fully equipped laboratory, huge presses and mixers — yes, and have you meet some of our Chester people, folks who have been making grinding wheels for generations. Taken all together, they're the reason we can talk about Cortland quality without reservation.

The result of the most modern manufacturing and engineering facilities teamed with father-to-son know-how and pride of workmanship is a commodity few manufacturers are privileged to offer their customers. We at Cortland are proud to have this stock in trade.



CORTLAND GRINDING WHEELS CORPORATION

Chester, Massachusetts

18

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A 3M Case History Report

STEEL POLISHING SPEEDED 10–15% WITH "PG" WHEELS

MANUFACTURER: Heintz Division of Kelsey-Hayes Co.
ADDRESS: Philadelphia, Pennsylvania.
PRODUCT MANUFACTURED: Automotive Metal Stampings.
3M ABRASIVE USED: "PG" Wheels.

HOW 3M ABRASIVES ARE USED: Finishing operation. Remove die marks, scratches, and other forming defects from cold-rolled carbon steel auto grille bars, prior to plating.

OPERATIONAL DATA ON 3M METHOD: Grit 220 Resin Bond Cloth "PG" Wheel on double-spindle floor lathe with buff-wheel.

OPERATIONAL DATA ON PREVIOUS METHOD: 2-station, 3-step method. 1st, #120 disc; 2nd, set-up wheel; 3rd, buff-wheel.

PROVEN ADVANTAGES OF 3M METHOD: Former 3-step operation reduced to 2 steps; "PG" Wheel and Buff. "PG" Wheel leaves no scratches on work piece; speeds production 10-15%.

OTHER 3M ABRASIVE PRODUCTS IN USE: "Three-M-ite" Resin Bond Cloth Portable "PG" Wheels on hand-grinders are used to remove in-use scratches, other imperfections from dies, without removing them from press. "PG" Wheels replaced hand methods, reduced repair time from 14 hours to 30 minutes.

WANT MORE INFORMATION? Send for free manual, "Modern Metal Finishing with 3M 'PG' Wheels." Write to 3M Co., St. Paul 6, Minn., Dept. AAH-109.

"PG" Wheels are manufactured in U.S.A. by 3M Company, St. Paul 6, Minn. Export: 99 Park Avenue, New York. Canada: London, Ontario

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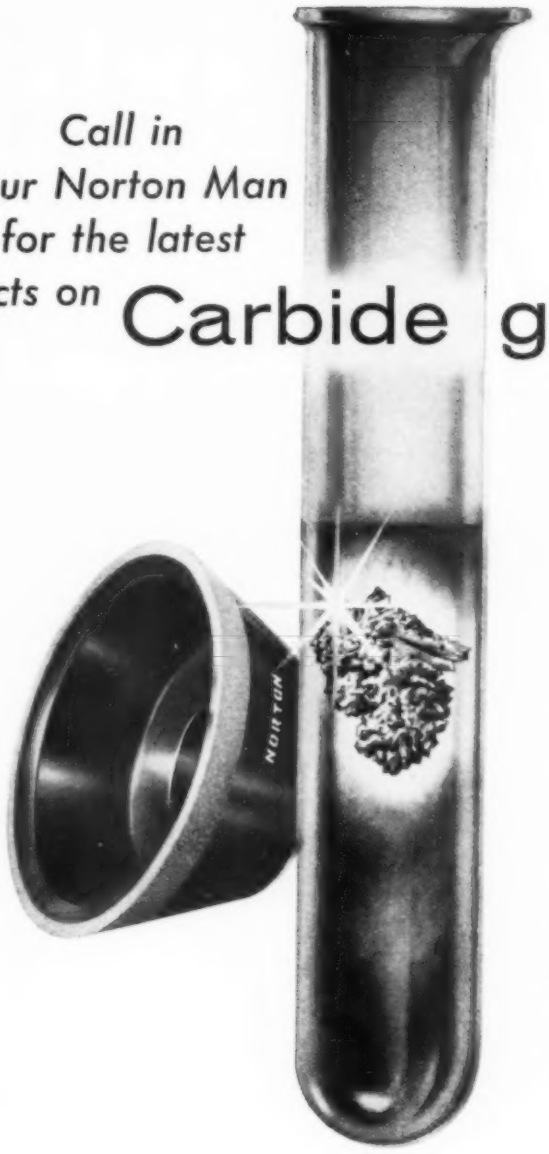
Carbide grinding with Norton wheels

using mined or man-made diamonds



Magnified View of a man-made diamond. The extremely jagged surface provides a large, tight-holding contact area for bonding. In the new Norton SD* wheels this extra gripping power, teamed with advancements in diamond wheel construction, reduces diamond loss and carbide loading to a minimum — typical of Norton leadership in getting the maximum working power out of all diamonds, mined or man-made.

Norton diamond wheels — the most complete line for carbide grinding — are backed by pioneering never equalled, whether the diamonds used are mined or man-made.

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Man-made diamonds are used to fullest advantage in the new Norton SD* wheels — proved in more than a year of nationwide, comparative testing . . . *In 63% of hundreds of field tests the average service life of Norton SD diamond wheels was at least 25% longer than the life of wheels using natural, mined diamonds.*

With each Norton diamond wheel, of mined or man-made diamonds, you get a certificate of the accuracy of diamond concentration. You can depend on this certificate to mean exactly what it says.

You can depend on your Norton Man, too. This expert Abrasive Engineer can show you how to get better grinding quality, longer service life and lower cost grinding for every dollar you spend on diamond wheels. NORTON COMPANY, General Offices, Worcester 6, Mass. Plants and distributors around the world.

*Man-made diamonds W-1944

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NORTON PRODUCTS: Abrasives • Grinding Wheels • Grinding Machines • Refractories • Electro-Chemicals — **BEHR-MANNING DIVISION:** Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes

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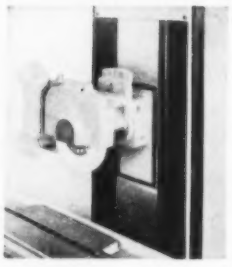
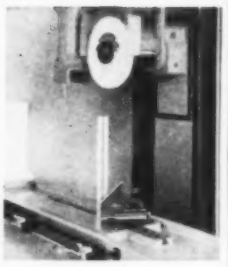
Heavier . . . smoother running . . . greater accuracy. Compare features. Only the Reid grinders offer you so many quality extras. Designed by Reid Bros., the most respected name in Surface Grinders . . . since 1901.



DUST GUARDING . . . Neg'-ator stainless steel roll type dust guards.

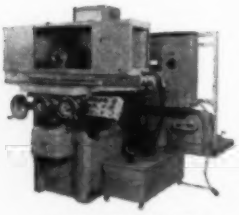


WORK HEIGHT . . . a full 15¼" from top of table to bottom of 7" wheel.

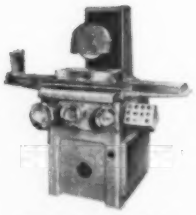
HEAD dovetail can be directio

REID PRECISION S

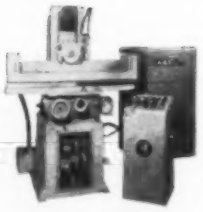
REID 618 P POWERED MODEL



REID GERMANIUM SLICING MACHINE



REID-O-MATIC 824 ALL ELECTRIC MODEL



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REID 61 GRINDIN

PRECISION GRINDING

WITH REID'S NEW HAND FEED MODELS 612 AND 618HA

More stability . . . *more* work height . . . *more* grinder, dollar for dollar!

These models are twice the weight of typical grinders in this size. Heavy, rugged construction eliminates vibration and resulting rejects. Reid hand feed grinders feature a full 18" center distance on the cross slide ways, *too* . . . another factor for greater stability.

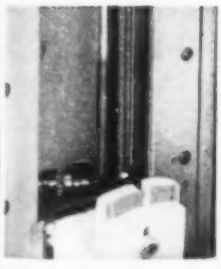
Vertical work height is now a whopping 15¼" from the top of the table to the bottom of the 7" wheel. The entire head and head way are dovetail mounted and designed for years of trouble-free use. Check the finger tip controls, underguarding, one-shot lubrication and a dozen other Reid features.

Dollar for dollar, you'll agree REID grinders are your soundest investment for your toolroom grinding.

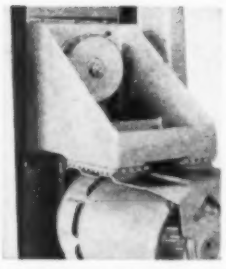
- Heavier than comparable grinders
- Longer ways for stability and wear
- 18" Center distance on cross slide ways
- Full 15¼" work height with a 7" wheel
- Sealed anti-friction bearings
- More horsepower
- Belt driven or motorized spindle available
- Cross slide lock standard equipment

SPECIFICATIONS

CAPACITY	7" (wide) cross slide travel 14" long table travel (612) 20" long (618HA) 15¼" vertical height from top of table to underside of 7" wheel
OVERALL HEIGHT	68"
BELT DRIVEN SPINDLE	1 H.P. Motor 3450 RPM Spindle 2950 or 3450 RPM
MOTORIZED SPINDLE	1 H.P., 3450 RPM offered at slight additional cost
NET WEIGHT	1425 lbs. (612) 1525 lbs. (618HA)
LUBRICATION	One-shot system included as standard equipment. Automatic lubrication available at extra cost.
OPTIONAL EQUIPMENT	J.I.C. and/or 110 Volt Controls
CHROME WAYS	

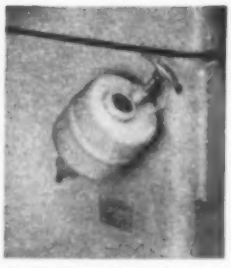


HEAD & HEAD WAY . . . dovetail mounted. The Head can be driven in both directions.

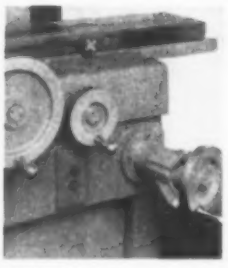


BELT DRIVEN SPINDLE . . . utilizes 1 H.P. 3450 RPM. Double sheaved to permit 2950 RPM or 3450 RPM spindle speed.

MOTORIZED SPINDLE . . . optional, can be furnished at slight increase in cost. 1 H.P. — 3450 RPM.



ONE-SHOT LUBRICATION . . . Bijur system for all way surfaces. Non-clogging. Convenient.

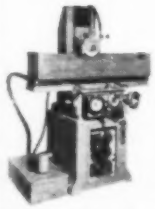


HANDWHEELS . . . all conveniently located. Full 9" Table handwheel less tiring . . . may be disengaged, rotated to any desired position, re-engaged.

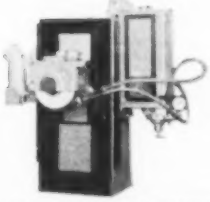
SURFACE GRINDERS

PRECISION SURFACE GRINDERS — REID

Manufacturers of precision surface grinders for production and toolroom needs



REID 618 PT WITH WET GRINDING ATTACHMENT



REID COOL GRINDING ATTACHMENT SHOWN ON COLUMN.

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Write for descriptive literature . . . specify model: 612 618HA

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Grinding Flat to Millionths!

These semi-cast steel compressor heads are ground to the almost unbelievable flatness of .000007", on a No. 11 Blanchard Surface Grinder. The finish measures 6 micro-inches. This is a regular production job in the plant of a leading electrical products manufacturer. Heads are 7" dia., and 3¾" thick; .005" of stock is ground off one surface; production averages 40 parts per hour. Whatever *your* surface grinding requirements may be, the job is done best when you "put it on the Blanchard". Write for your copy of "Work Done on the Blanchard", and for "The Art of Blanchard Surface Grinding".

THE BLANCHARD MACHINE COMPANY
64 State Street,
Cambridge 39, Mass., U. S. A.

Use postpaid card. Circle No. 210

WHEREVER ABRASIVE OPERATIONS ARE PERFORMED

Editor's Page

OCTOBER 1959

EQUAL TIME

You are reading these pages and those of other trade publications to obtain information which will increase your value to the organization with which you are connected. Trade publications are therefore developed to provide you with information which will benefit you the most. This information is obtained in several ways. The editorial staff calls, writes or visits many of the readers or plants involved in their area of interest. Information is submitted by companies or authorities involved in the field of interest.

Still another source of information is submitted by you, the reader. No trade publication editor has ever been able to say that his readers have overwhelmed him with material. It is important at this point to note that the information you receive from trade publications is only as good as the selection the editors have to choose from.

Let's sit back for a moment and look at this situation. You are involved with grinding and finishing operations in a technical capacity with 10, 15, maybe 25 or 30 years experience. Much of the material we print is merely a review for you. But, you are still reading and looking for more. Through the years you have obtained this information from those who have gone before you or those next to you. Possibly you have received this information through the pages of GRINDING AND FINISHING. But, how about the guys coming up behind you? Shouldn't they receive as you have? Let's look at it from still another view. In a free country we have a choice to give or not to give. You can bet your last ruble that the Russians are required to tell everything to every party member whether he has the time or not. Now, this doesn't mean you should pass out trade secrets which give a competitive edge. However, everything you know to be of help which you have not seen in print will be of benefit to many.

You are probably thinking this guy wants us to do his job for him. In a way you're right. However, no matter how large the editorial staff or how hard they work there are still many exceptional stories that go unwritten. An editorial staff's purpose, in theory, is to evaluate and edit the material reported. If you report the information you have on hand, editors of all publications will have a twenty-four hour job.

W. M. Patterson

Managing Editor

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vice president and editorial director

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associate editor

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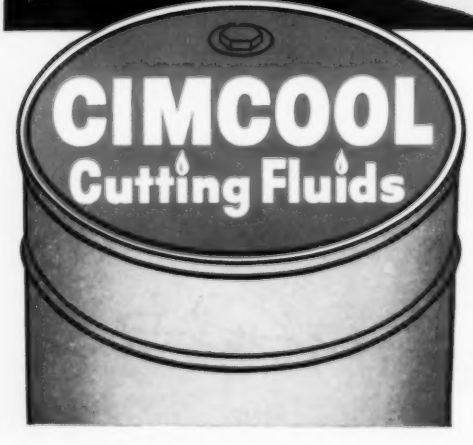
advertising art director

"...saving about $80 a week!"
CIMPLUS, transparent, rust-preventing cutting fluid of the famous CIMCOOL family, scores sensationally at another busy shop.*
SALES REPORT
2
plant makes woodworking machinery. Their 7 grinding machines, running 8 hours a day, were using a soluble oil coolant at the rate of 24 gallons a week. They changed to Cimplus and now they get by fine on only 10 gallons of Cimplus a week. They're saving about $80 a week!
They report they have no rancidity and no rust problems now. They like the transparency of Cimplus, too. The operators can see what they're doing.
Bill Matzke
Chicago Office
*Firm name available on request.



FOR 100% OF ALL METAL CUTTING JOBS

Production-proved products of The Cincinnati Milling Machine Co.

CIMCOOL S2 Concentrate—The pink fluid which covers 85% of all metal cutting jobs.
CIMPERIAL—newest in the famous, industry-proven line of CIMCOOL® Cutting Fluids!
CIMPLUS—The transparent grinding fluid which provides exceptional rust control.
CIMCUT Concentrates (AA, NC, SS)—For every job requiring an oil-base cutting fluid.
ALSO—CIMCOOL Tapping Compound—CIMCOOL Bactericide—CIMCOOL Machine Cleaner.

For full information on the complete family of CIMCOOL Cutting Fluids, call your CIMCOOL Distributor. Or contact Cincinnati Milling Products Division, Cincinnati 9, Ohio.

®Trade Mark Reg. U.S. Pat. Off.

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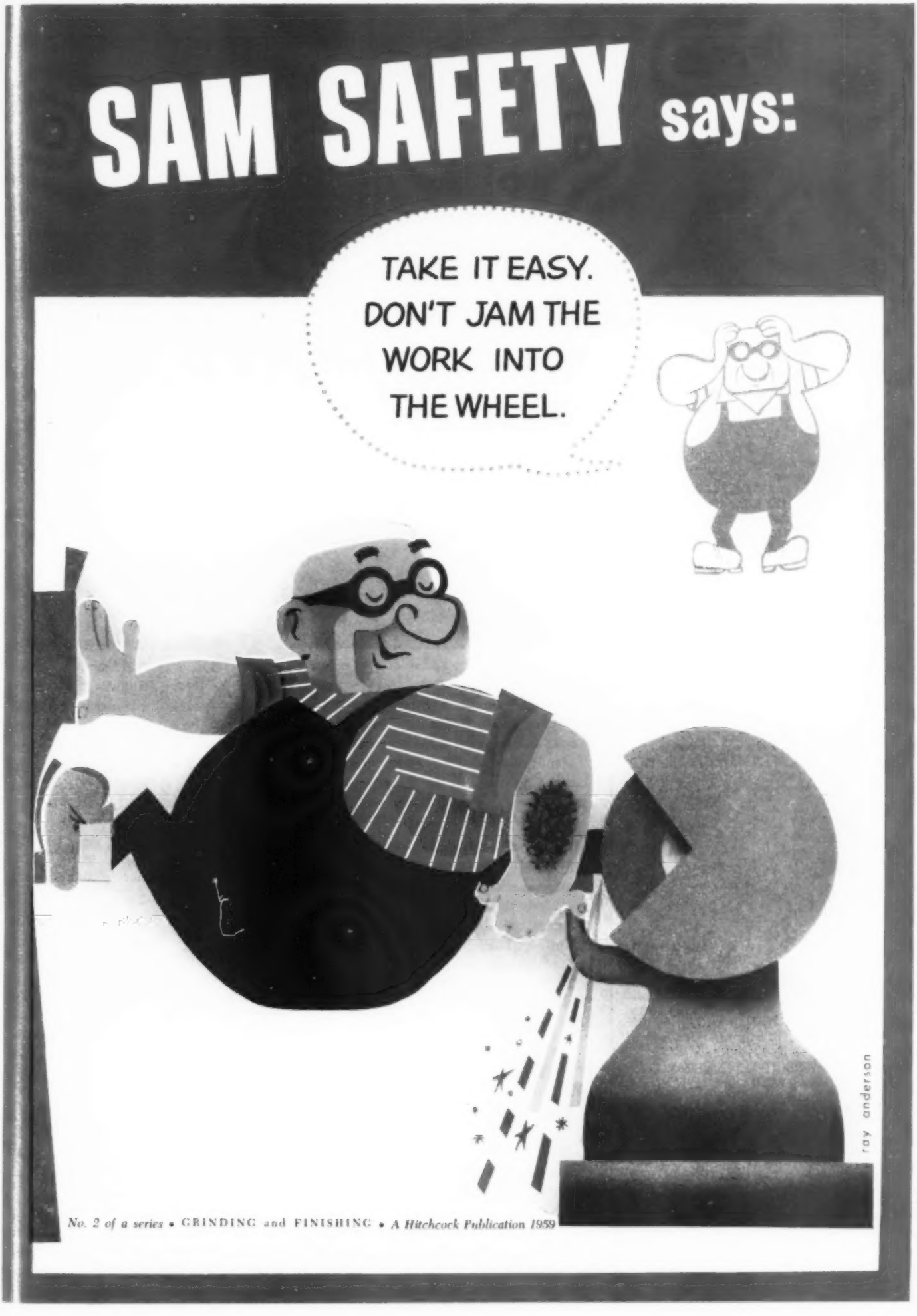
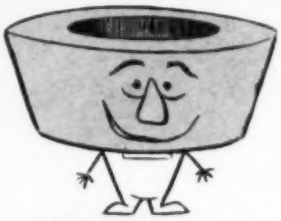
SAM SAFETY says:



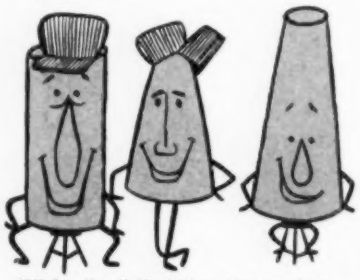
No. 2 of a series • GRINDING and FINISHING • *A Hitchcock Publication 1959*

MEET THE FM PORTABLE GRINDING TEAM

"My name is A16-P4B2 — most popular guy in the fabricating shop! My job is to remove excess weld — fast and economically!"



"I'm CA14-Q4B2. The grinders in the foundry cleaning room keep me busy on gray iron castings. I have a special talent for this rugged work and can do a great job for **you**. How about trying me out?"



"We're the little fellas who get into those hard-to-get-at places. There's a whole gang of us — all sizes and shapes in vitrified and resinoid bonds. Most of us are on call — why not call us now!"

VITRIFIED and RESINOID GRINDING WHEELS and SEGMENTS

A Guide to grinding wheel selection on request. Write TODAY!

THE FM

FULLER MERRIAM CO.

WATER STREET
WEST HAVEN, CONNECTICUT
TELEPHONE WEST 3-2501

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Metalworking in General

Future engineers pause during a tour of the Pratt & Whitney Company, Inc., West Hartford, Connecticut, to view an early milestone in mass production. The instrument, a Rogers-Bond Universal Comparator, was developed and used at Pratt & Whitney in 1880 to establish the first accurate standard inch in this country. This development gave American industry the means to standardize and to make interchangeable parts, thus opening the way to mass production. In the foreground is one of the first four bars that was graduated on the Universal Comparator.

Tenth Standards Conference Meets in Detroit

Standards in space technology, value analysis in purchasing and the relative merits of inch and metric systems for United States industry will be among the subjects to be discussed at the Tenth National Conference on Standards to be held in Detroit on October 20-21-22, 1959.

A highlight of the Conference, sponsored by the American Standards Association, will be an address by U.S. Army missileman, Major General J. B. Medaris, Commanding General of the Army Ordnance Missile Command. He will speak on "Standards for Survival" at the Awards Dinner on October 21, when the Association's Howard Coonley Medal and the Standards Medal will be presented. The two gold medals are recognized as being the country's highest honors in the field.

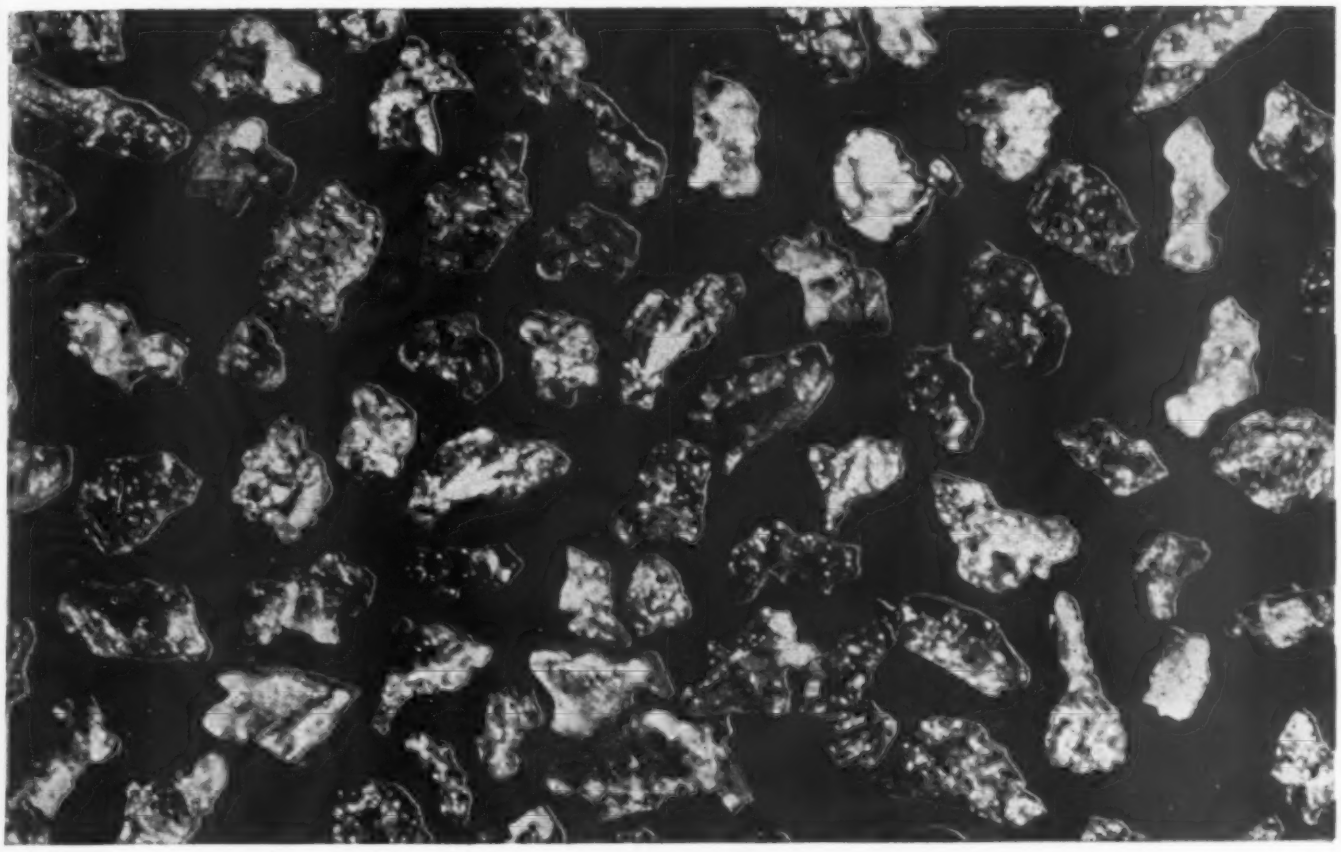
41st Metal Show Nov. 2-6 at Chicago

Returning to Chicago for the eleventh time since its inaugural there in 1919, the 41st edition of the American Society for Metals' National Metal Exposition and Congress will be staged November 2-6, 1959.

Theme for the show is "Materials and Fabrication Preview of the Soaring '60's". The exposition will be held in the International Amphitheatre of the city with congress sessions in the several Chicago hotels.

Nearly 400 exhibits will occupy 300,000 square feet of exhibit space in the International Amphitheatre and adjoining Exhibition Hall, all at street-floor level and under one roof

Amphitheatre hours for the Metal Show are: Monday (Nov. 2) 10 a.m to 6 p.m.; Tuesday and Wednesday (Nov. 3-4) Noon to 10 p.m.; Thursday and Friday (Nov. 5-6) 10 a.m. to 6 p.m.



How G-E Man-Made Diamonds perform where it counts: in the plant

Grinding wheel users report on actual production results with Man-Made diamonds. Findings: substantial savings in every case!

General Electric Man-Made industrial diamonds—through actual customer "in-plant" comparisons are saving thousands of dollars in diamond grinding wheels. Here's proof:

A saw manufacturer using 3¾" x 1½" x 1¼" flaring cup wheels to sharpen carbide saws. Wet grinding with 120 grit, 100 concentration, resinoid bonded wheels. The natural diamond wheel removed only 9 cubic inches of carbide. The G-E Man-Made diamond wheel removed 34.8 cubic inches of carbide—a superiority of Man-Made over natural of 290%!

An automobile manufacturer's results on tool and cutter sharpening with 5" x 1¾" x 1¼" flaring cup wheels. Dry grinding with 100 grit, 100 concentration, resinoid bonded wheels. The natural diamond wheel sharpened 696 cutters. The Man-Made diamond wheel sharpened 1217 cutters *and still had one-third of the wheel left*—a measured superiority of 162% in favor of G-E Man-Made industrial diamonds.

A carbide manufacturer using 16" x 2" x 12" wheels for cylindrical grinding. Wet grinding with 120 grit, 100 concentration, vitrified bonded wheels. Natural diamond wheel removed 928 cubic inches of carbide . . . Man-Made diamond wheel removed 1510 cubic inches. G-E Man-Made diamond superiority of 63%!

These examples, with results typical of those found in many other applications, emphasize the superiority of General Electric Man-Made industrial diamonds. Regardless of the wheel type, G-E Man-Made diamonds are saving diamond wheel users valuable production dollars today because wheels using Man-Made diamonds last longer. Specify G-E Man-Made diamonds when you order diamond wheels and prove in your own plant the savings possible on grinding and cutting costs.

Want more information? Write: *Metallurgical Products Department of General Electric Company, 11177 E. 8 Mile Ave., Detroit 32, Michigan.*

METALLURGICAL PRODUCTS DEPARTMENT

GENERAL ELECTRIC

CARBOLOY® CEMENTED CARBIDES • MAN-MADE DIAMONDS • MAGNETIC MATERIALS • THERMISTORS • THYRITE® • VACUUM-MELTED ALLOYS

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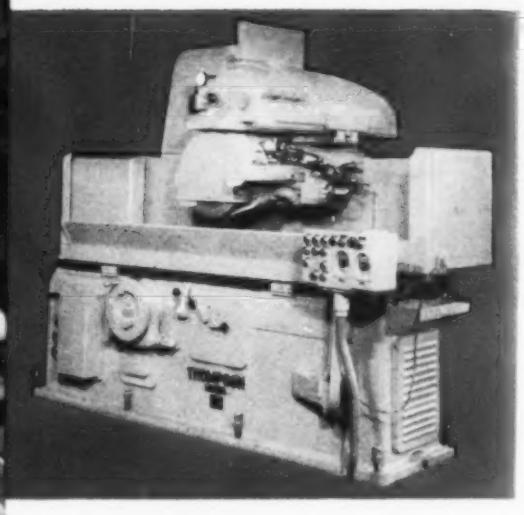
THE NEW THOMPSON PLUNGE-MATIC SURFACE GRINDER



COMPLETELY AUTOMATIC

With the new Plunge-Matic, Thompson now offers a plunge feed machine for those surface grinding jobs where the area to be ground is constantly covered by the grinding wheel width. Designed for fast production, the Plunge-Matic is completely automatic—including downfeed, wheel dressing and automatic compensation.

Shown above is one of four Plunge-Matics in use at the Disston Division, H. K. Porter Company, Inc., grinding high quality hand saws. The saws are held on tapered flux bars or magnetic shims and the wheel face is dressed straight with an automatic power operated wheel truing device. The four machines are equipped with a pre-selected variable downfeed arrangement which automatically decreases the downfeed rate as the contact area of the work increases. The wheel heads are also equipped with oscillating crossfeeds. Being completely automatic in their cycles, the four machines require but two operators who load and unload only.

Constant Accuracy is Assured by Hydra-Cool

All Thompson Plunge-Matics are made in various types and sizes to meet all job requirements. All machines of 40 inches and up in work length are equipped with the Hydra-Cool Hydraulic System*—the exclusive Thompson feature which eliminates all heat distortion throughout the machine.

* PAT. APPLIED FOR

The new Thompson Plunge-Matics are designed to grind contoured as well as flat surfaces with equal efficiency. The three drawings at right represent but three of many contour jobs which Thompson Plunge-Matics are now handling successfully.

Send for descriptive folder on this new Plunge-Matic surface grinder.

Thompson SURFACE GRINDERS

SPECIFICATIONS

GRINDERS:	Thompson Type C 12"x16"x-48" Plunge-Matics
WHEELHEAD:	40 HP
WHEEL:	20"x8"x12"
STOCK REMOVAL:	Approx. .010" from each side
PRODUCTION RATE:	60 saws every 50 minutes from 2 machines with one operator

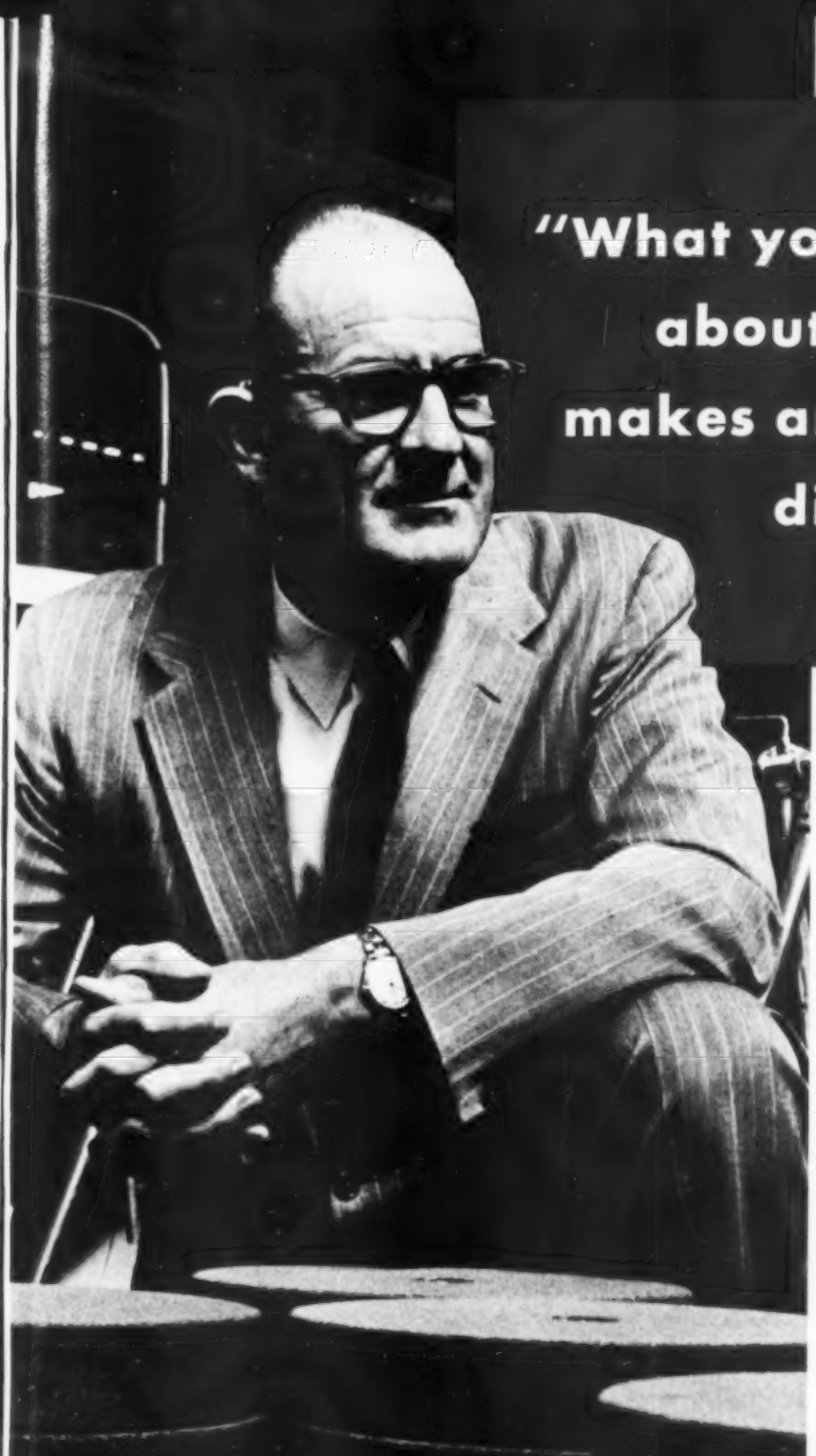
THE THOMPSON GRINDER CO.

SPRINGFIELD, OHIO

"Keep Thompson in mind for that daily grind"

Use postpaid card. Circle No. 214

"What you don't know about grinding wheels makes an important difference"



Elden L. Auker, Marketing V. P. of Bay State Abrasives, is a man who knows the industry through years of experience both in working in the field with Bay State customers and from close association with the research and development programs at Bay State's manufacturing headquarters in Westboro, Mass.

"It's a sad but proven fact that all grinding wheels are *not* the same... even when they *look* the same and, in many cases, even when they have the same general specifications.

"The fact that many of our wheels are safer, faster-cutting and more efficient than their competitors is a tribute to our research and development people... who have led the world in such important abrasive developments as REINFORCED RAISED HUB DISC-WHEELS, GRIT-CLOTH, HIGH SPEED SNAGGING WHEELS, DURACUT...and whose latest developments promise to give even greater reality and meaning to our long-established 'Wheels of Progress' trademark.

"To show you specifically what I'm talking about, let's take a look at some of the current research and product quality projects under way at Westboro..."

NEW IDEAS, NEW TECHNIQUES for better grinding at lower cost...

"A completely new approach to the manufacture of honing stones is in the works. It starts with a unique, atmosphere-controlled kiln which promises more perfect uniformity of honing stone performance than has ever been possible before. The process winds up with tests under actual production conditions, as shown above. Technician Arthur Taylor is running a vertical honing machine which is one of the very few such test machines—and may well be the only one—devoted solely to research use by an abrasive manufacturer. Tests run on this machine show up the smallest weaknesses and inconsistencies of texture, stone-hardness, etc., and these are weeded out so that production stones are uniform in every respect."

BAY STATE

BAY STATE
WHEELS of PROGRESS

"Better grinding at lower cost to you – that's our business . . . and that's what you see in the making here on these pages. We start with good ideas . . . but only the best ever pass our ruthless tests."

Elden L Anker

BAY STATE VICE PRESIDENT, MARKETING

"Sure, thermal tests are unspectacular but they're brutal just the same. Here a snagging wheel is placed in a heat chamber and peripheral surface is heated just as it would be in normal use . . . only more severely, by far. Thermocouples are imbedded into the side surface and here you see James McElroy checking the temperature gradient from periphery to center. Extreme differential between outer and inner temperatures eventually cracks wheels and only formulations with outstanding resistance to thermal cracking are ever put into production."

"Our vacuum mixing is a very critical process and Bay State leads in designing production machinery that ensures completely bubble-free material for honing stones. High vacuum in the mixing chamber forces even tiny bubbles out of the mix and rigid temperature control further guarantees uniformity of consistency. A technician is shown here pouring abrasive grain into the mixer preparatory to adding fluid bond material."

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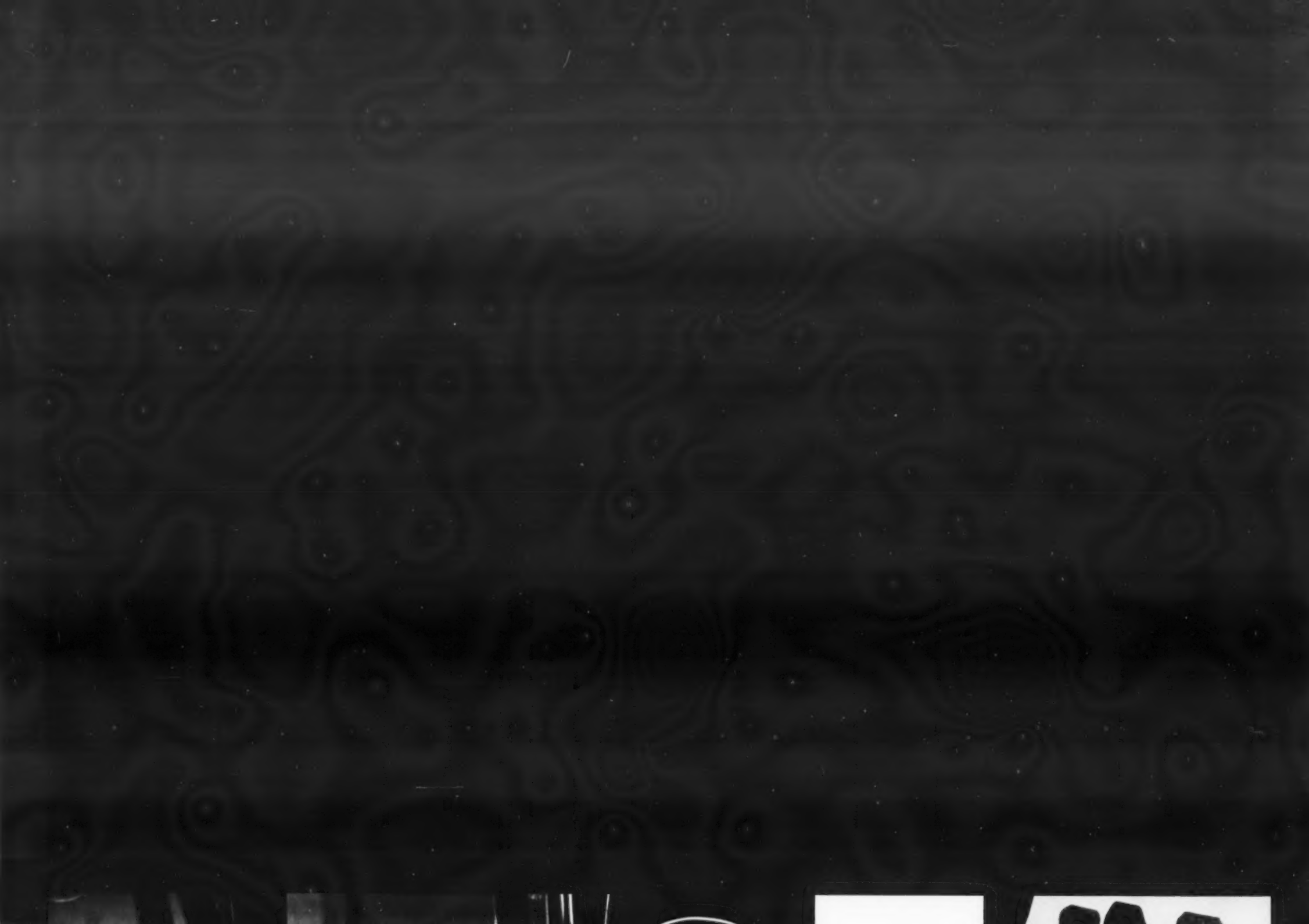
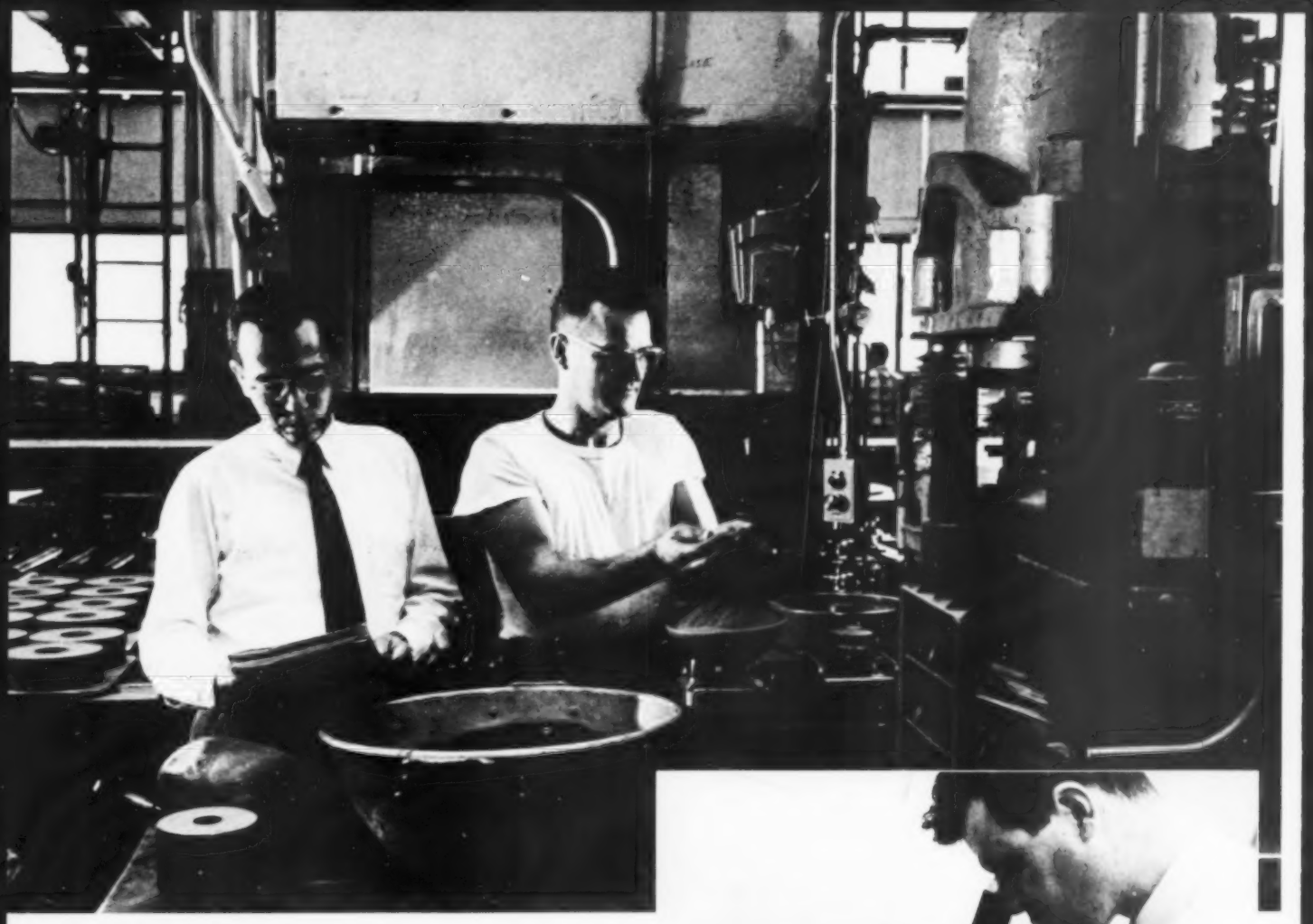
"Breaking the sound barrier? Well, you might think so when Bay State's new hot-pressed, high-speed snagging wheels are tested to destruction. Locked inside a huge steel drum, the big wheels are whirled at ever-increasing speed until they literally explode under the tremendous centrifugal stresses imposed. No wheel is put into production unless tests prove that it has at least a 4 to 1 safety factor. Bay State snagging wheels are now safety-rated at higher speeds than current grinders can produce. That's technician Clement Gareri removing shattered fragments of a wheel that burst into smithereens at one of the highest surface speeds ever recorded in the industry."

"Tensile strength, plus!
Figure-eight briquette samples of snagging wheel material are gripped in steel jaws and placed in a machine capable of exerting a direct pull of 50,000 lbs. Under the monstrous tensile loads imposed, even rock-hard snagging wheel material stretches before it breaks and the tests immediately show up formulations that resist tensile loads most effectively . . . and are therefore safest for use."





"Increased automation of vitrified wheel production helps speed up customers' orders by eliminating many time-consuming steps. Conveyors deliver mix to the press line where each press has its own, automatic drying oven. Here, Factory Superintendent Richard Thompson checks the formula and other special instructions for a particular job as operator Henry Bouvier carefully weighs out the correct amount of mix. That's the drying oven in the background and the press at right. This largely automated set-up is virtually unique in the industry."

"Petrographic Microscopy may be a jawbreaker but it's vital to effective grinding. Research Ceramist Irvin Havens here checks the relationship between abrasive grain and bond in a very hard wheel. Another project of his is to determine the importance of grain *shape*. If sufficiently improved performance can be gained by sorting abrasive grains for shape as well as size . . . Bay State wheels of the future will incorporate this additional refinement."

"What's a Sonic Grader? It's an electronic nightmare as far as I'm concerned. But to an expert like Bay State's Manager of Quality Assurance, Roy Leaman, it's an extremely advanced but very worthwhile device that helps give Bay State wheels an extra edge over competition. The wheel is excited by a gentle tap and the resultant tone, or frequency of vibration, is picked up by the microphone (lower right). The operator compares this frequency with a series of electronically generated notes until he has a perfect match. The result gives a more perfect matching of wheel formulations, when re-orders of particular wheels are required."

"Bay State's **QUALITY CONTROL** programs mean better grinding at low cost for you!"

"Measuring the air flow through the side of a cut-off wheel gives us an accurate check on wheel density. This test, being conducted here by Quality Control Manager James Gilman and Louis Silvestry, is made after pressing but before baking. Twenty four carefully distributed check points are tested so that the entire wheel is covered.
To the best of my knowledge, we're the only grinding wheel manufacturer to have developed such an accurate and comprehensive density-test for cut-off wheels."

oscopy may be a jaw-ffective grinding. Research checks the relationship be-bond in a very hard wheel. o determine the importance improved performance can e grains for shape as well as the future will incorporate

? It's an electronic night- an expert like Bay State's Leaman, it's an extremely e that helps give Bay State n. The wheel is excited by a r frequency of vibration, is right). The operator com-lectronically generated notes result gives a more perfect hen re-orders of particular

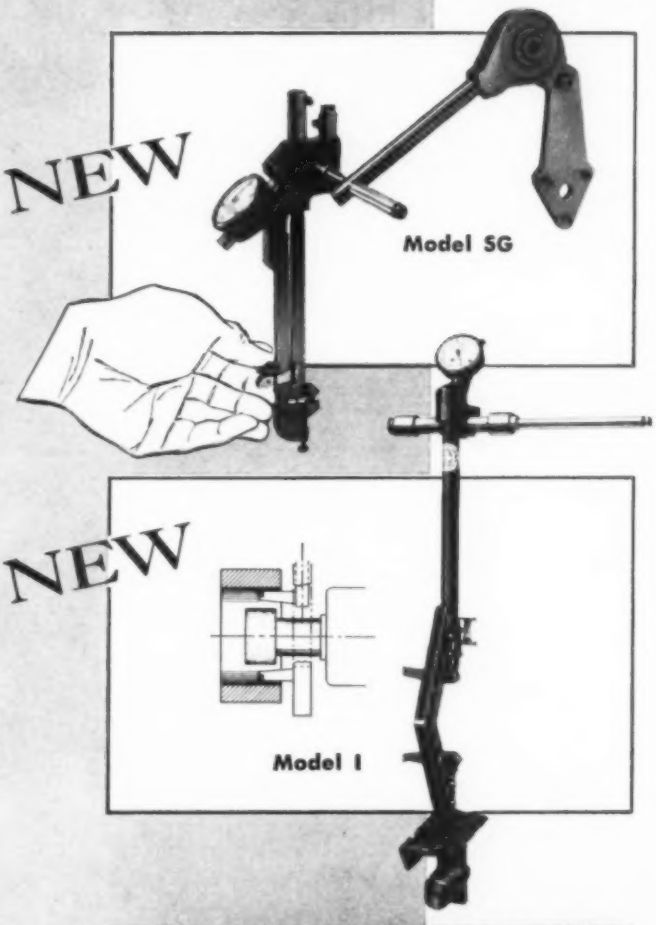
"'Samson's Hair' for reinforced disc-wheels?
What helps make Bay State disc-wheels so strong and so safe? It's the fiberglass reinforcement fabric, of course, but like Samson's hair, it has to be protected and one of Bay State's most jealously guarded secrets is the composition of the protective resin used for that purpose. This coating was the first and is still by far the best resin that successfully prevents crushing of the glass fibers during the manufacturing process. Here, Research Director Dr. H. Nathan Stone and Research Chemist Donald Grubba inspect a sample of fabric that has been removed from a *finished* wheel by burning away the bonding material in an electric furnace. The fibers are completely undamaged."

BAY STATE ABRASIVES

BAY STATE WHEELS of PROGRESS

Bay State Abrasive Products Co., Westboro, Massachusetts.
In Canada: Bay State Abrasive Products Co., (Canada) Ltd., Brantford, Ontario.
Branch Offices: Chicago, Cleveland, Detroit, Los Angeles, Pittsburgh. *Distributors:* All principal cities.

3 NEW ARNOLD GRINDING GAGES Distributed by FEDERAL



Model LG

Here are three new Arnold Grinding Gages. The Miniature (SG) and King Size (LG) Models now permit continuous measurement for O.D.'s from .060" all the way up to more than 30". And, for the first time, there is an Arnold Grinding Gage to continuously measure I.D.'s. These, like all Arnold Gages, eliminate having to "grind and check". Size of part is shown continuously as metal is being removed, so operator always has positive and precise size control without having to stop his machine until the piece is finished. No oversize regrinds . . . no undersize rejects.

FOR SMALL O.D.'s Model SG

Calipers adjustable from .500" to .093"
Special calipers as small as .060"
Easily adapted to automatic size control of small parts
New style supporting hub

FOR I.D.'s Model I

Checks internal diameters continuously *while* grinding
Contacts adjustable over 1½"
No interference with grinding wheel
Turret-mounted indicator rotates to any position
Easy to position and retract

FOR LARGE O.D.'s Model LG

Continuously measures diameters up to 30" and larger
Single dimension or wide range adjustable calipers
New ball bearing mounting
Rigid, heavy duty frame

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FEDERAL PRODUCTS CORPORATION
94410 EDDY STREET,
PROVIDENCE 1, RHODE ISLAND

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FOR RECOMMENDATIONS IN MODERN GAGES . . .
Dial Indicating, Air, Electric, or Electronic—for Inspecting, Measuring, Sorting, or Automation Gaging

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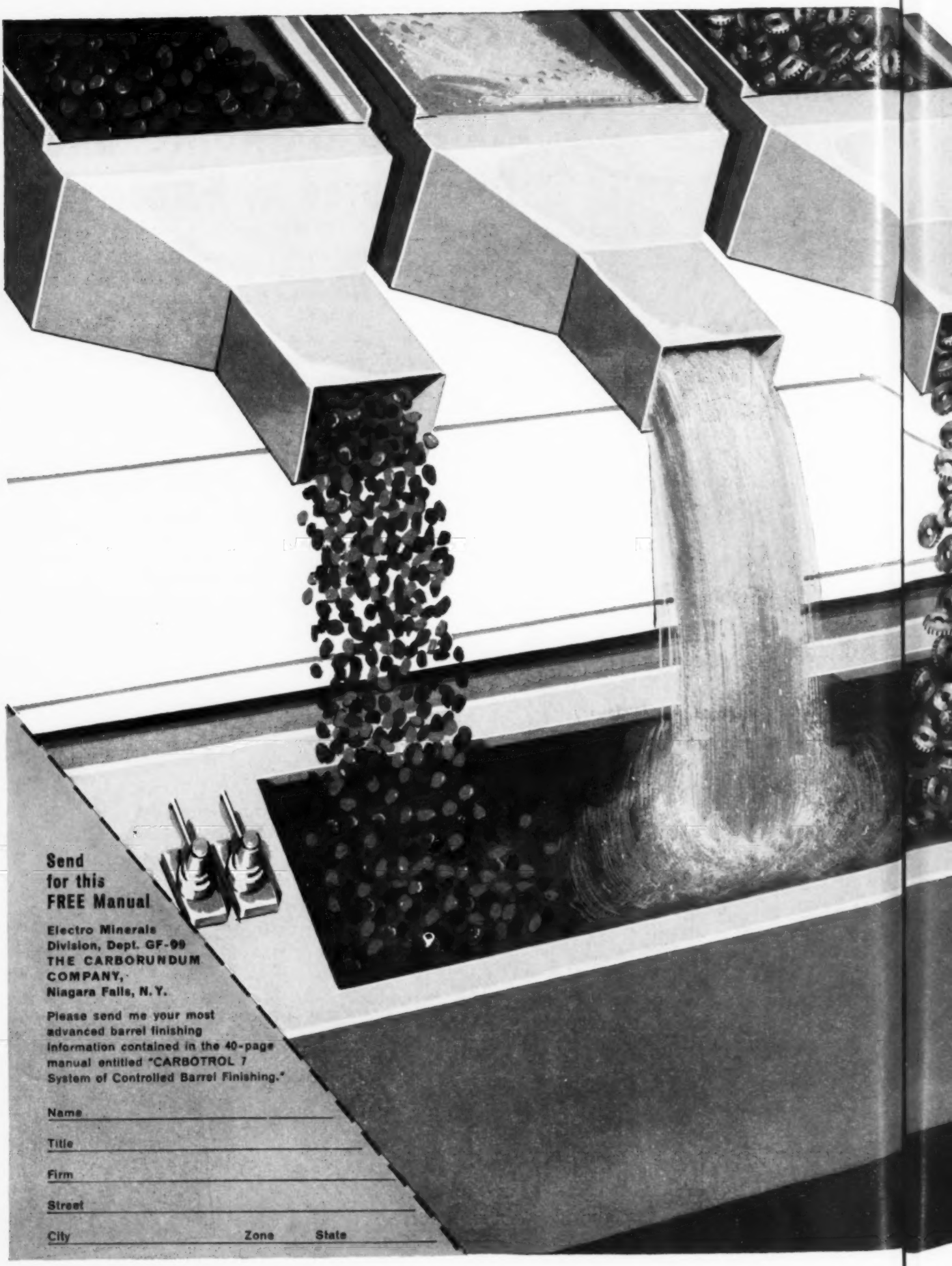
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COMPANY,
Niagara Falls, N.Y.
Please send me your most
advanced barrel finishing
information contained in the 40-page
manual entitled "CARBOTROL 7
System of Controlled Barrel Finishing."
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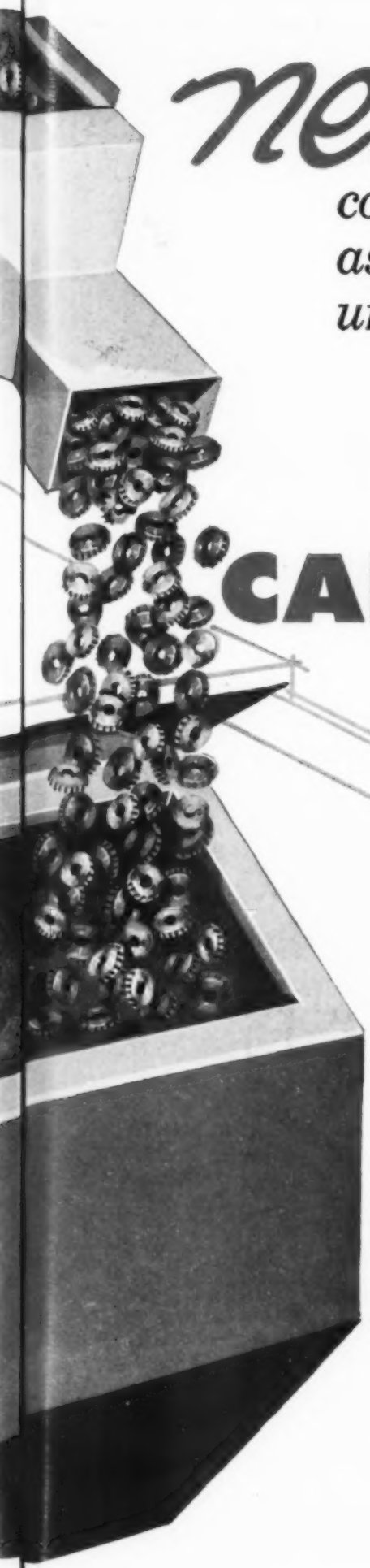


new *advancement in controlled barrel finishing assures faster...more uniform results...*

CARBOtrol 7

An exclusive process by CARBORUNDUM featuring a balanced line of precision media, compounds and machines...the right combination for the finishing results you want!

Years of experimentation and field research have resulted in a *balanced* line of precision-controlled media, compounds, and barrel finishing machines and equipment—*now available from one source*—CARBORUNDUM. The CARBOTROL 7 System is a new technique of applying these basic materials and equipment to the toughest finishing problems. It assures exceptionally high output with absolute uniformity of parts and finishes at *substantial* economies. If you are hand finishing metal parts today or trying to get along with *outmoded* shop equipment, it will pay you to investigate CARBOTROL 7—the Carborundum control process for low-cost metal finishing. A staff of specialists and trained distributors from coast to coast are ready to assist you. WRITE FOR FURTHER INFORMATION TODAY!

for expert advice and service...
call the man from

CARBORUNDUM

REGISTERED TRADE MARK

Use postpaid card. Circle No. 217

Introducing the NEW MODEL 1-A SEVER-ALL Machine... CUTS AT 3 to 6 SECONDS PER SQUARE INCH—ECONOMICALLY

MANY EXTRA FEATURES AT A DELIVERED COST UNDER $500

You get the cut quality and capacity of machines nearly three times as expensive when you use the new Model 1-A SEVER-ALL oscillating dry abrasive cut-off machine. Available from your distributor's stock. Here's why the #1-A SEVER-ALL is ideal for industrial and machine shop operations:

BIG CAPACITY • Up to 2" square solids, 3½" O. D. pipe and tubing, 3" angle iron, and 4" channels . . . of cold rolled, stainless, and alloyed steel; cast iron; and nonferrous metals. Wheel oscillation, an exclusive feature in this price range, provides this *above-average* capacity.

SPEED • Cuts a 2" x 2" hardened steel bar in 16 seconds . . . other shapes and sizes at 3 to 6 seconds per square inch.

QUALITY • Clean, smooth cuts, even on large sections, because wheel oscillation provides cooler cutting.

ECONOMY • In addition to low initial cost, the Model 1-A SEVER-ALL is inexpensive to operate . . . occupies minimum floor space . . . requires little or no set-up time . . . eliminates annealing costs . . . gives more cuts per wheel because of oscillation.

SIMPLICITY • Just two SEVER-ALL cutting wheel specifications will do *all* your SEVER-ALL cutting jobs. A positive, screw-type vise holds all regular shapes, and an adjustable work stop provides speed and accuracy.

ANGLE CUTS • Optional accessory permits cutting angles up to 45° in either direction.

NEW SEVER-ALL AVAILABLE FROM DISTRIBUTORS

Very likely your own distributor already stocks the Model 1-A SEVER-ALL machine and wheels. If not, let us know, and we'll give you the name of your nearest SEVER-ALL distributor. Also, we'll be glad to send you complete details on this new machine. Just ask for **Bulletin DH-106.**

ALLISON-CAMPBELL DIVISION AMERICAN CHAIN & CABLE

926 Connecticut Avenue, Bridgeport 2, Conn.

Use postpaid card. Circle No. 218

ACCO

You Asked . . .

ARTHUR RAKESTRAW
Contributing Editor

Weights of Grinding Wheels

• What is a practical formula for calculating the weights of grinding wheels?

—F. L., Gary, Indiana

The weight of a grinding wheel varies primarily with its volume, and to some extent, as indicated in the table of Unit Weights/Grams per Cubic Inch, with the abrasive and bond, as well as with the grit size.

Approximate wheel weight can be determined as follows: Wheel weight = area of wheel—area of hole x thickness x unit weight in grams ÷ 454 (to change result to pounds.). Areas of the wheel and the hole can be calculated by common formulas—

(πR^2 or $\frac{1}{2}D^2$ x 3.1416)

or are available in a number of handbooks.

Example:
Calculate the weight of a wheel 20" x 6" x 12", 60 grit, aluminum oxide ceramic bonded wheel.

Weight = 314.16 — 113.10 x 6 x 35.
= 201.06 x 6 x 35.
= 42222.6 grams.
Divide by 454 to change to pounds.
Weight in pounds = 93 lbs.

Length of Trials for Grinding Wheels

• When should you quit trying trial wheels?—J. Z., Dubuque, Iowa.

Without complete knowledge of the particular operation and of the trial history, it would be impossible to make a definite statement. It depends largely on the improvements in grinding that you are looking for or expect to obtain by means of the testing program.

To shut off trials completely would only result in shutting the door to improvements in abrasive grain and general abrasive wheel manufacture.

A testing program entered into with the full cooperation of everyone concerned requires concerted effort and thought, and is an added expense. In some instances trials may not be so fruitful in that you may have already reached a practicable limit in grinding performance. In such cases, further tests might not warrant expense.

The difficulty in selecting wheel specifications for trial is in attempting to fulfill definite requirements which have already been established. It is much easier to develop a suitable wheel specification at the start of a grinding operation, when procedures are being established.

To make the point clear, permit this example. During the Second World War it was my responsibility to set up grinding wheel specifications and requirements for all of the grinding operations on an aircraft engine program. When the various parts went into manufacture and difficulties arose, changes in handling or procedure were made to overcome the difficulties. A very large percentage of the original recommendations, however, continued to be standard throughout the entire program.

There are definite limitations to any grinding operation, beyond which there is little hope for improvement with abrasive products now available.

On the other hand, there are always operations which are not up to this point. In any case, we believe that periodic review of all grinding operations should be made in order that you may benefit from any product developments or procedural changes that would make a significant improvement.

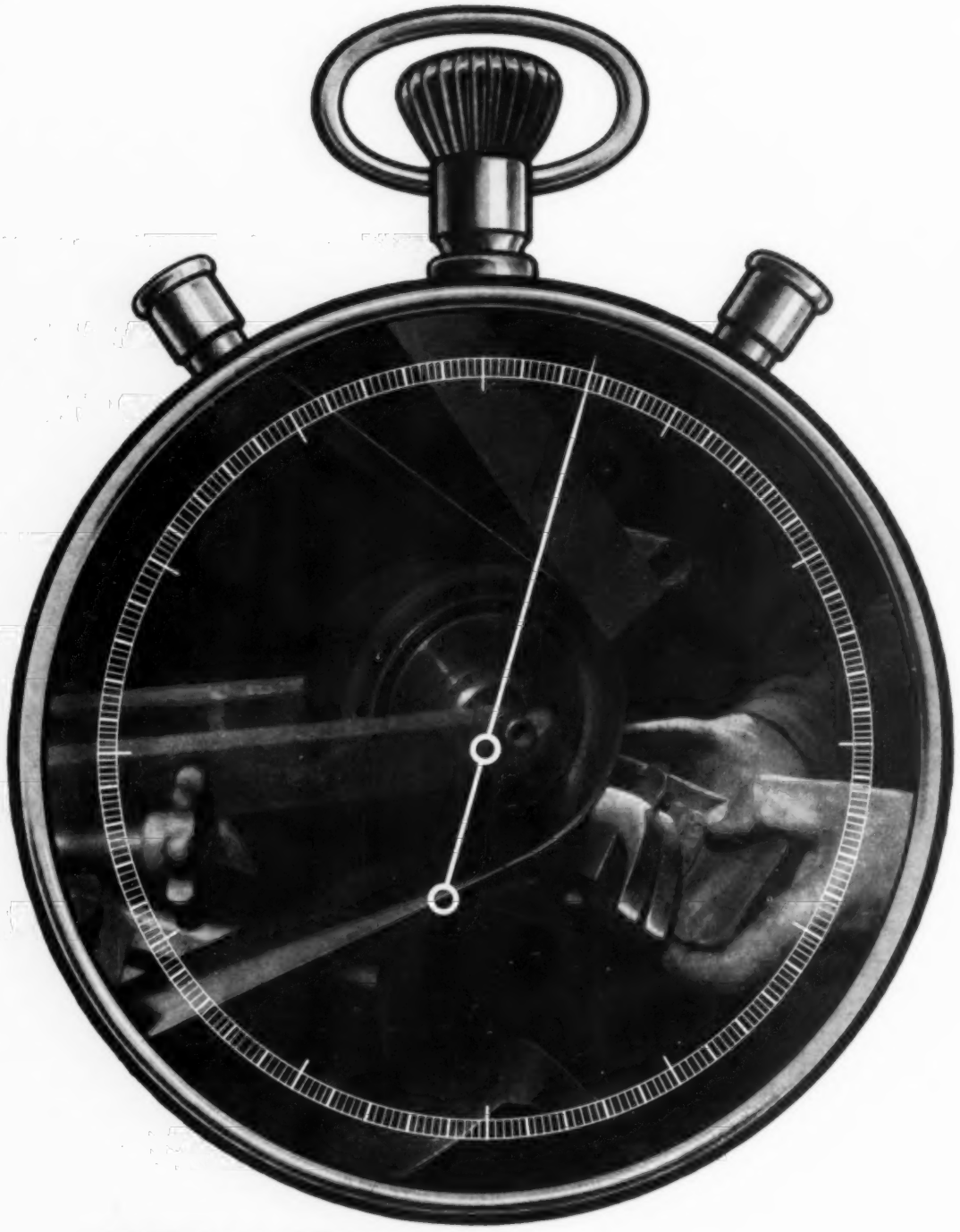
Unit Weights/Grams Per Cubic Inch

Abrasive, Bond	Grit Sizes			
Ceramic	**20 & Coarser**	**24 to 70**	**80 to 220**	**240 & Finer**
Al_2O_3	36	35	34	32
SiC	32	31	30	28
Organic				
Al_2O_3	44	40	37	37
SiC	36	33	30	30

You Asked . . . has become a very popular page in GRINDING and FINISHING since it was established over a year ago. The questions have covered everything from detailed operating problems to rather broad basic ideas. Replies have been equally varied.

You can use either the READER SERVICE CARD or a separate letter to submit your problem or question. We'll get it answered as soon as possible and send you a reply, in addition to the published answer.

—The Editors



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Design for Grinding

Grinding Cam Contour Saves Five Ways

Switch from milling produces more accurate contour, eliminates polishing operation, lowers material costs, cuts down scrap, reduces processing time.

● One of the key parts in a Boyar-Schultz deep hole drill is a ball thrust bearing in which a cam contour has been generated, to oscillate the drill and break the chips into small granules.

By this means the chip problem in deep hole drilling has virtually been eliminated. It also results in longer drill life and cooler operation. The "flutter" or "wave" cam oscillates the drill three times per revolution.

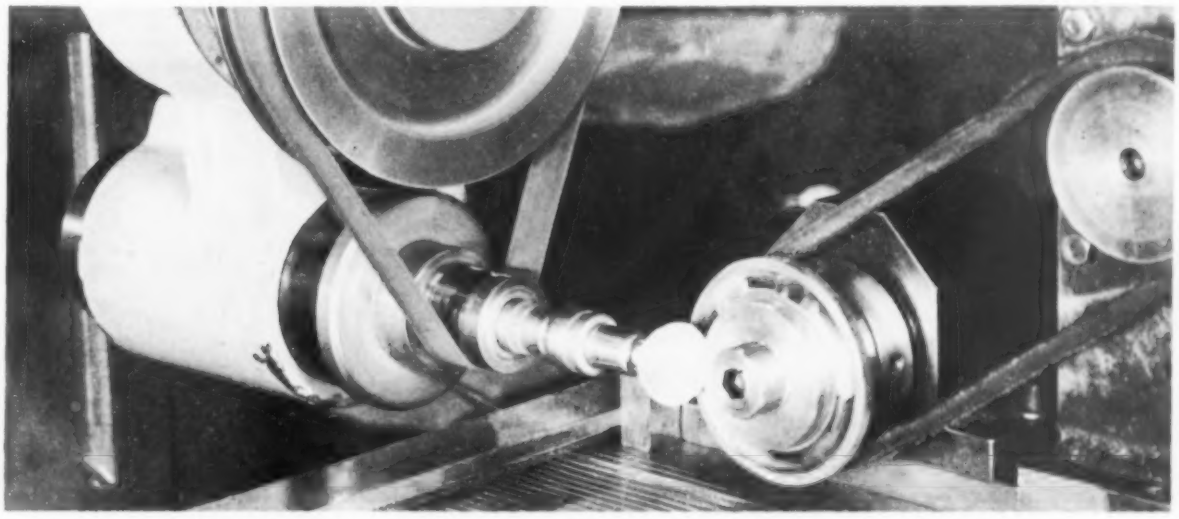
Originally this cam surface was generated in a soft blank which was later hardened and polished. In hardening, a number of the blanks became warped and useless. The milling tool was a ball-end carbide cutter in a vertical mill.

The need for better control of the accuracy of the cam sparked the change to grinding.

To do this, a fixture which was basically a power-driven work head with a cam guided spindle was built and mounted on a surface grinder. A shape W-218 mounted wheel, vitrified aluminum oxide, 46 grit, L grade, spherically dressed to the diameter of the balls in the bearing, was mounted in a Boyar-Schultz high speed grinding attachment. The wheel is fed into the revolving cam race until the contour is completed.

With the change there is no more heat treating distortion, as the bearings are hardened before grinding. The finish resulting from grinding is good enough to eliminate the need for polishing.

Originally the cam races had to be made complete from blanks. Now it is feasible to modify standard purchased bearings by grinding, cutting down both material cost and processing time. • • •



The set-up for grinding a cam contour into a ball thrust bearing. The grinding attachment holding a mounted wheel is at the left, the power driven work head with cam guided spindle at the right.

Above is a view of the Micromatic honing machines which hone the connecting rods for the Falcon. Both the crank and pin ends are honed on these machines.

How Ford Grinds and Hones Falcon Engines

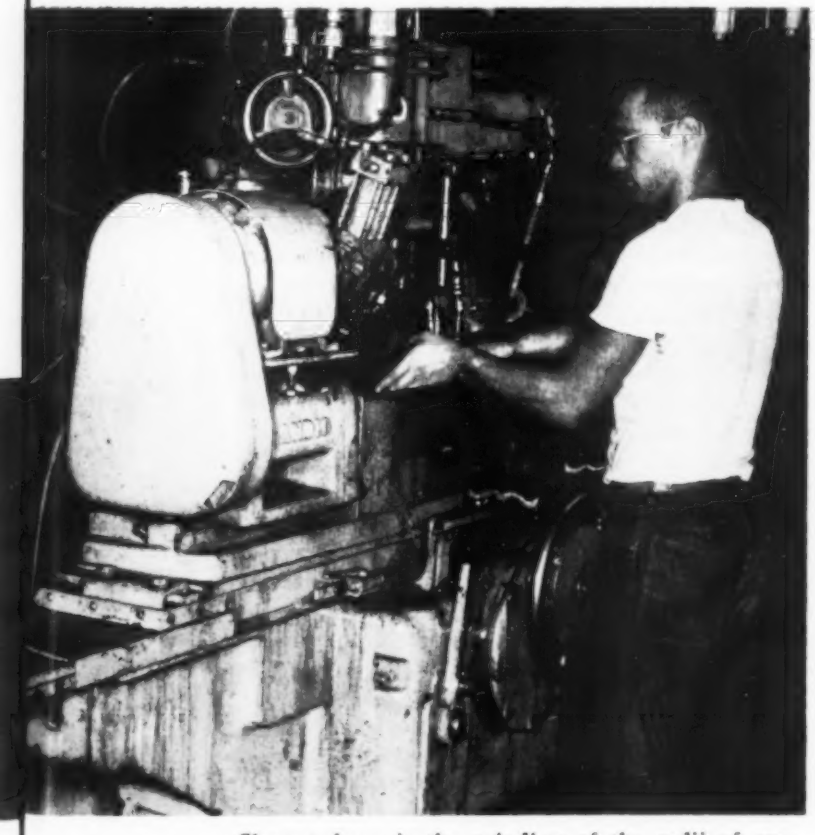
By M. M. PATTERSON
Managing Editor

The grinding of the camshaft of Ford's new economy car continues to eliminate all turning operations on the lobes of camshafts. The honing of the connecting rods and the cylinders of the engine block enhances the precision machining of this completely new engine.

● Clinton D. York, plant manager of the Ford Lima Engine Plant, emphasized that any changeover to produce a new engine starts with good planning. The specific problem at Lima was to change a 1958 eight-cylinder line to produce the six-cylinder Falcon engine. Mr. York pointed out that the building block concept of machine tool design has helped immensely and is credited for the short time involved in the complete changeover. Still another point in the operations at the Lima Plant is the fact that the original planning for the production area allowed enough space for quality checking and maintenance, thus improving the housekeeping, which is excellent at the Lima Plant. The large space provided in this plant is mainly a capital investment whereas house-cleaning, maintenance, checking are continual, and by providing sufficient floor space the over-all cost is greatly reduced.

Two major areas of grinding on any internal combustion engine are the camshafts and crankshafts. The crankshaft and camshaft grinding at the Lima Plant was covered in the November, 1958, issue of GRINDING and FINISHING. However, in discussing the camshaft grinding with Mr. Frank Zeiger, the production manager, and Mr. Lyle Gilroy, the production superintendent, it was brought out that their grinding methods have almost entirely eliminated turning of the camshafts. Only the bearings, gear O.D. and sprocket of the camshaft are turned before grinding.

The two most important honing operations on parts of a combustion engine are the connecting rod, wrist pin and crankshaft bores. The other honing operation is on the cylinders of the block. In these two cases the closer control of post machining of these I.D.'s have provided for better control and more accurate honing of these parts at high production rates.



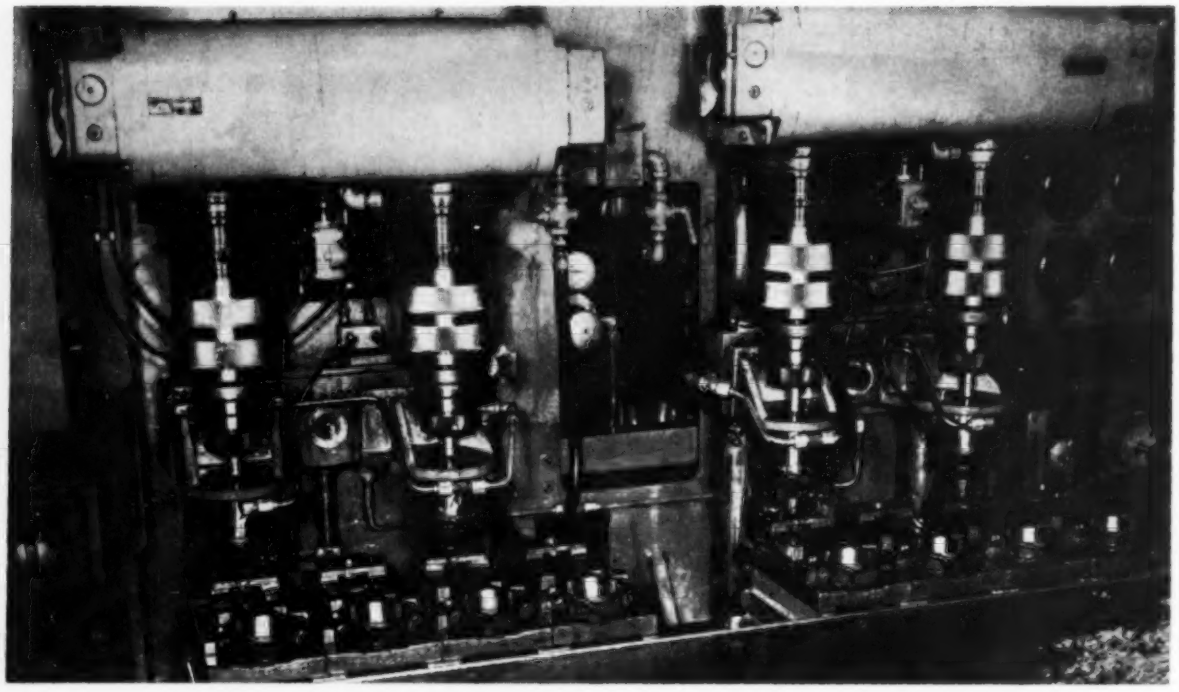
Shown above is the grinding of the radii of camshaft of the Falcon Ford economy car. Machine being used is an angular grinder.

Camshafts

There are two reasons why the camshafts are ground from the rough. The first is the use of shell molding in producing the casting, which permits holding much more precise dimensions than are possible in green sand molding. The second is that the shell molded casting is induction case-hardened to 50 Rockwell C minimum to a ¼" depth on the lobe contour and ⅛" on the base circle before grinding. Rough grinding follows the case hardening. The stock removal on these operations is .080" on the diameter of the cam lobe. Infeed is .040" per eight seconds, while the wheel speed is approximately 6500 sfpm. The machines are Landis

Clinton D. York
Plant Manager
Ford Lima Plant

Frank E. Zeiger
Production Manager
Ford Lima Plant



This close-up shows the honing of the connecting rods. Note the eight position fixture. Four positions provide for loading and unloading while honing is performed at the other four.

HOW FORD GRINDS AND HONES FALCON ENGINES

continued

automatic camshaft contour grinders, which are manually loaded and unloaded, obtaining an approximate production of 12 parts per hour per machine. Dressing is performed by a Citco single point diamond which indexes after every pass, passes being at 3" per minute.

Gaging of the rough grinding utilizes Sheffield air gages for in-process gaging and snap gages after each cycle, alternating the lobes which are checked. Gaging of the bearing diameters are performed on every surface. The dressers are automatically set to size by the in process gaging equipment. The wheels used for rough grinding are all A-601-N-V for the lobes. The main bearings are ground on Landis machines using A-601-M-V wheels after the main bearings have been turned, this being the only turning operation on the camshafts. The finished grind on the cams is performed on the same type of machines, removing .010 inches of stock and holding a 20 or less rms. The wheels used in this operation are A-801-L1-R rubber bonded. A final operation is performed on an Impco Lapping Machine using aluminum oxide 180 grit cloth, with a glue bond. It was noted here that the resinoid bonded cloth would be too sharp when used with the alloy cast iron employed in the camshaft. The lapping of the main bearings hold 12 rms or less at a production rate of 150 parts per hour per machine. All camshafts pass through a special Landis multiple wheel grinder which removes any foundry flash. A Landis angular grinder is used to grind the sprocket post and thrust face.

It should be noted that the shell molding of alloyed grey iron, while eliminating turning operations that were previously performed on camshafts, presents some difficulties. It is first of all absolutely necessary to have a free cutting wheel as the material is much different from forged steel. The analysis and resultant grain structure of the cast iron alloy is such that if the abrasive is not free cutting the necessary surface finish cannot be obtained. Although special machines are used, they are standard for this type of operation so the change over from the 8-cylinder camshaft to the Falcon 6-cylinder camshaft did not present major changes in the machines. This of course, was augmented by the building block concept. One of the problems that did arise was the flexing of the smaller shaft, and in order to obtain the straightness, two steady rests are now used on the camshaft grinders instead of the one required on the larger shafts. It should be noted that in all the camshaft grinders, three slow revolutions of the camshaft are alloted for spark out.

The main bearings are held to within .0005 inches and the Landis multiple wheel grinder which performs the rough and finishing operations after turning, removes .010-.012 inches during roughing, and finishes

easily within the .0005 inches required. The finished cams are checked on Vinco contour gaging machines to plus or minus .001 inches from the center line.

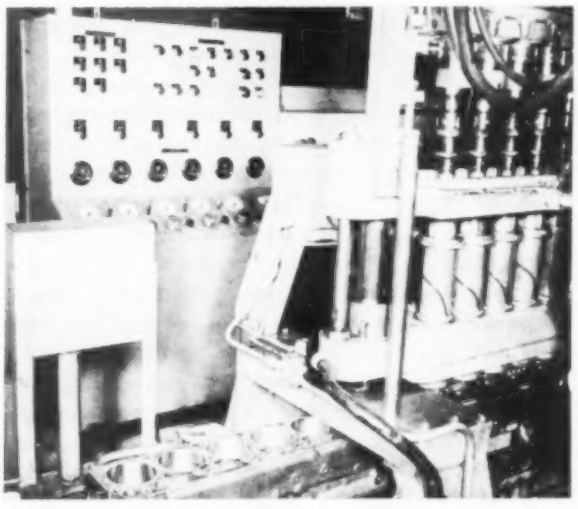
This present method of grinding camshafts is understandably more practical than the more conventional methods previously used. At one time cam mills or shapers were used to rough out the forged camshafts, which were then, in turn, ground in three operations. Other improvements over the older methods include automatic indexing, dressing and positioning, while taper and finish become important considerations.

Honing Connecting Rods

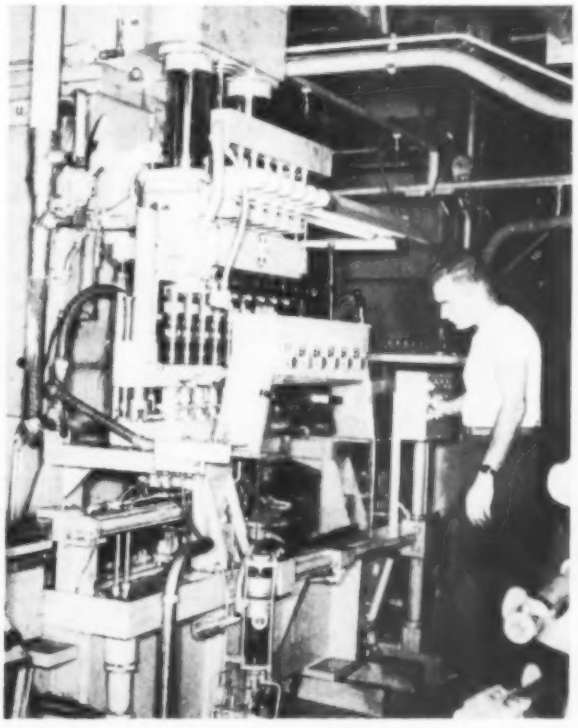
Four Micromatic, Model 710-4, four-spindle honing machines, hone both the crank and pin bores of the connecting rods. These connecting rods are steel forging of SA 1041 steel, which are semi-finish bored to about .0015 to .002 inches of size, which is removed by honing. Production on these machines is 450 parts per hour, per bore, per machine. The stones used in these machines are A-180-P-6-V30. Finish obtained on these bores is 35 to 50 rms. Production per set of stones averages approximately 485 pieces. These machines operate automatically except for loading and unloading. Air gaging automatically compensates for stone wear and cycling of the machine. Tolerances are within .0005", however, production actually holds to within .0003" in order to average to the .0005" allowing for a 75% quality control. Taper and out-of-round are held to .0004". An 8-part fixture shuttles from left to right and back, providing for loading two rods for the pin end and two rods for crank end while honing the other four rods. Post gaging is performed on a Sheffield machine, 3 column, Precision Air Model 353.2. Size, out-of-round, taper, weight and center distance are all gaged by this machine. 100% inspection is performed on all connecting rods. This machine then separates according to the error. A coolant used on the honing operation is a special purpose mineral cutting oil—Sulpho-Chlorinaled type. Hardness of the connecting rods is held to a 229 to 262 Brinell.

Honing Cylinder Walls of the Block

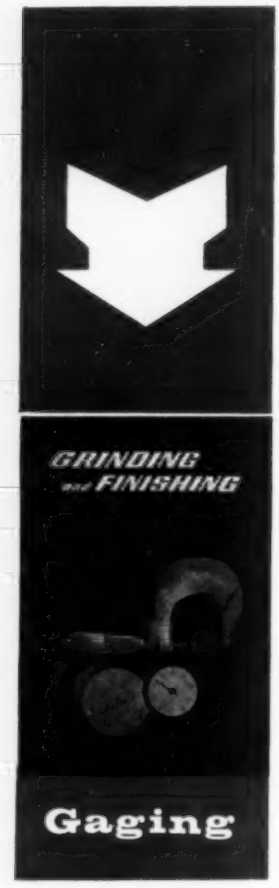
Previous to honing, the cylinder bores are semi-finished with cluster carbide boring tools, leaving approximately .002" for honing. Honing is performed on a Micromatic multi-spindle machine, having capacity of approximately 90 blocks per hour. The cylinder walls are finished to between 20 and 30 rms and are held within .0005" for out-of-round. Diameters are held within .0024" allowing a reversed taper of .001" over the full length of the bore. The Micromatic machine is completely automatic, the blocks being conveyed from the boring machine directly to the honing machine, where in process air gaging allows for an 8 second spark out at the end of the honing process, automatically collapses and withdraws from the block upon the final sizing and spark out of all the cylinders. An at random check or gaging by the operator is performed on the blocks, checking in four places diameters within each bore, using a Sheffield air gage which also checks for out-of-round. A grit and grade of stones used on this operation is C-180-K-VO2. Coolant is a kerosene base which is held to approximately 65° F. and must be kept clear at all times. The operator also at random checks the surface finish with a profilometer. Stone wear is approximately 350 pieces per set of stones. As in all Ford operations, inspectors spot check the blocks after honing. The blocks are checked once again by the final inspector for grade size. • • •



This close-up from behind the honing machine shows the control panel for the Micromatic machine. This honing operation is completely automatic.



This full view shows the Micromatic multi-spindle honing machine honing the cylinders of the Falcon engine block.



Number 3 of a Series

"Mikes"; Fixed Gages; Dial and Air Gaging

What's the best type of gage for a given application? Compares and contrasts adjustable instruments such as micrometer and vernier calipers with plug, ring and snap gages, as well as with comparison devices such as mechanical dial gages and air gages.

By RICHARD L. McKEE
Associate Editor

● The sheer variety of gages in any major manufacturer's catalog is amazing. Not only are there the standard types, but the combination can multiply like rabbits. Such terms as "air snap gage" and "electronic micrometer," to say nothing of the trade names, can become very confusing.

No one can become a gage engineer in ten easy lessons. There are, however, certain basic ideas for considering types of gages. This article will discuss micrometers, vernier calipers, fixed instruments such as plug, ring and snap gages, dial gages, and air gaging. The final article will cover electric and electronic optical and sonic gaging.

All gaging can be reduced to three basic functions. There must be a contact between gage and workpiece. The resulting data is interpreted, and information is relayed back to the production machine for required adjustments. There may be auxiliary operations, such as amplification of the contact signal or sorting of the product after the inspection, but these modify, rather than replace, the basic three.

The entire sequence may be mechanical and manual, as with an operator using a micrometer to check his output and adjusting his machine. It may be entirely electronic, as with some of the automatic arrangements in which the gage is in entire control and makes minute adjustments for grinding wheel wear and other factors. Or it may involve combinations—air-electric, air-electronic and similar set-ups.

In this discussion, the so-called combination instruments will be treated in the section of their basic principle of operation. Thus, an air snap gage will be covered as an air gage rather than a snap gage; electronic micrometers, with other electronic instruments; and dial snap gages, with other dial indicators.

Micrometers and Verniers

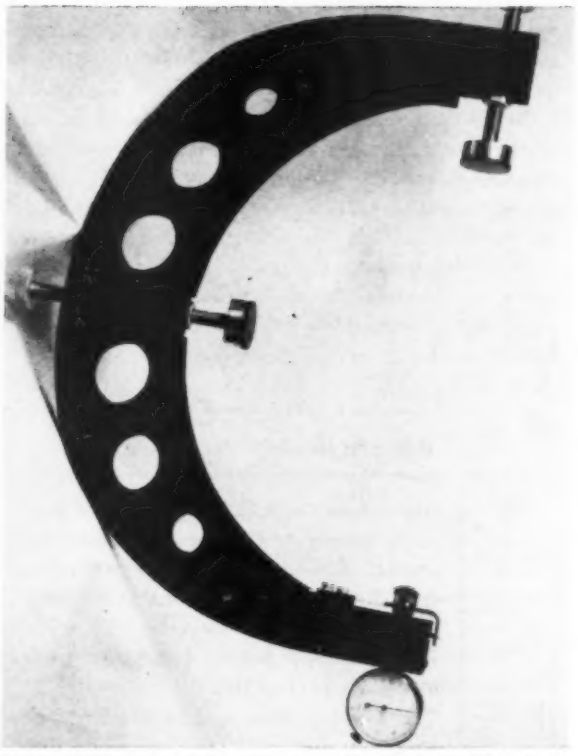
It may be something of a misnomer to refer to these devices as gages. But they are extensively used precision instruments which can be employed interchangeably with gages. Both, but particularly the "mike," accepted symbols for precision.

The popular concept of a "mike" is probably an outside micrometer caliper, measuring dimensions from 0 to 1". There are, however, many different sizes, types of frames and contact surfaces or anvils.

The mechanisms of all are similar—an accurately-threaded screw, turning in a fixed nut so that it can be advanced or retracted at a specified rate.

The micrometer has many advantages as a measuring instrument. It is convenient. It is highly flexible. The first cost is relatively reasonable, and it is easily maintained. The mechanism is simple. Micrometers, incidentally, are classified according to their largest possible dimension, and have a stated range, often one inch, under the maximum.

The normal range of accuracy is in thousandths of inches, though with a vernier reading it is possible to read to "tenths."



Large micrometer for use in roll grinding. Micrometers of this size are often custom-built. (Photo—Brown & Sharpe)

A popular type of micrometer. (Photo—Brown & Sharpe Manufacturing Company)

On the other hand, common micrometers are subject to variations in reading caused by differing pressure, and must be carefully applied, especially on O.D. measurements, to insure that the diameter is actually being checked, rather than some lesser dimension. Periodic checks with a working set of gage blocks at various points throughout the range of the instrument are essential to maintain accuracy. Most micrometers are built with adjustments that can restore their original accuracy. Care is also required in applying the instrument precisely at right angles to the surface being checked; otherwise an incorrect reading results.

In larger sizes, particularly over 12", weight and maneuverability become factors, though progress is being made in reducing weight. In this range, accurate measurement in "tenths" is questionable.

All of the above gives an indication of the optimum applications of micrometers. They require a certain amount of skill both in application and in reading, hence are best used by skilled operators or experienced inspectors. They are subject to human error both in application and reading. Being adjustable, they are better adapted to job shop or tool room work where the volume of production is small and sizes change rapidly. For a skilled man who takes pride in his work, the micrometer is a flexible and accurate instrument.

The vernier principle of measurement was discovered over 300 years ago by the man whose name it bears. Basically, it depends on reading the difference between two differently graduated scales.

A vernier caliper, for example, consists of a bar called a beam, calibrated for the main scale, with one fixed jaw and a movable jaw containing the vernier scale. It is used for both O.D. and I.D. measurements, with the internal measurements limited by the thickness of the jaws at the point of measurement.

In use, the vernier caliper is applied to the piece-part in much the same fashion as a micrometer. The jaws are adjusted to the dimension and locked in place. Then the device is removed from the piece-part and read. Reading must be done in a good light, and preferably with a magnifying glass, though vernier calipers are available for which magnification is not required. A second difficulty in reading vernier calipers is parallax—shifting of the reading because of a shift in the position of the observer. It's the same situation as rider in the right front seat of an automobile looks at the speedometer and concludes that the car is going about five miles faster than it actually is travelling.

Both the micrometer and the vernier principles are used in height and depth gages, though the operation of these is slightly different.

continued

Using a vernier caliper for an inside measurement. After adjusting and locking the jaws, the caliper should be read in a good light, and usually with a magnifying glass. (Photo—The L. S. Starrett Co.)

Fixed Gages

For production in any volume, the limitations of any device requiring adjustments for each measurement are obvious.

One alternative is the use of fixed instruments—plug, ring and snap gages—which can be applied directly to a part to show whether a particular dimension is within tolerance. In each case, two checks are necessary, as can be illustrated with a plug gage. In checking any internal dimension, the "Go" end of the gage should enter the hole, while the "Not-Go" end should not.

It is often feasible and less expensive to combine both ends in one unit, particularly with plug gages. The problem in the combination is that the "Go" end is subject to much greater wear.

Ring gages are most often two sections, with the "Not-Go" section generally distinguished by an annular ring cut into the knurled outside surface of the gage. It is possible, of course, to have a two-in-one arrangement. Snap gages are separate units, with the outside pin (s) set to the "Go" dimension, while the inner pin or button is set to the "Not-Go" dimension.

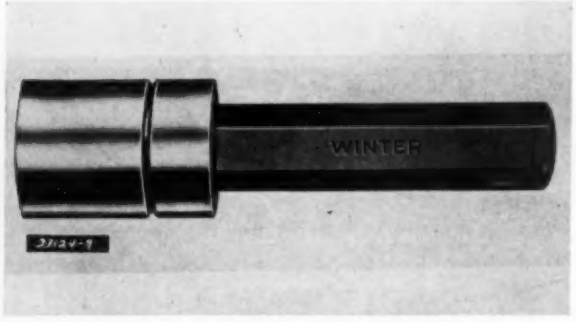
All three types of gages are widely used. They are the fastest of the manually-held gages, precise within the limits of most shop work, require little skill to operate, and are inexpensive in unit cost. Properly seasoned, they are stable, and carefully used they require little maintenance beyond periodic recalibration.

On the other hand they share the common difficulty of showing nothing of the amount of variation of the dimension from the nominal. They give a black-or-white, yes-or-no type of reading. If a hole is at all out-of-round, it gets classified by its shortest diameter.

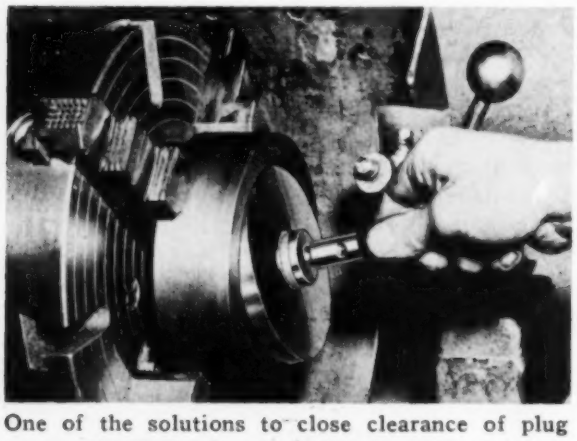
The most important element in the care of fixed gages in grinding shops is protecting them against abrasion from abrasive particles and dirt. The following list of tips for gage care is a good guide.

Do's and Don't for Gage Care*	
D O	Learn how to hold, use and store your gages properly. Fit must be snug and smooth. Wooden, felt-covered gage racks, with the felt oiled occasionally, will help keep gages clean. Roll or twist gages slowly into the work, to get the proper feel. Check every gage against master gages before use, at least once on every shift, and before returning it to the tool crib.
D O N' T	Force a gage into or over a part being checked. Lay gages on metal benches, machines or dirty surfaces. Spin parts on or off gages. Causes wear. Clean gages in water, soluble solutions, kerosene or carbon tetrachloride. All these cause rusting. Lay gages in sunshine. Expansion causes errors. Use gages with visible burrs, nicks or other irregularities.

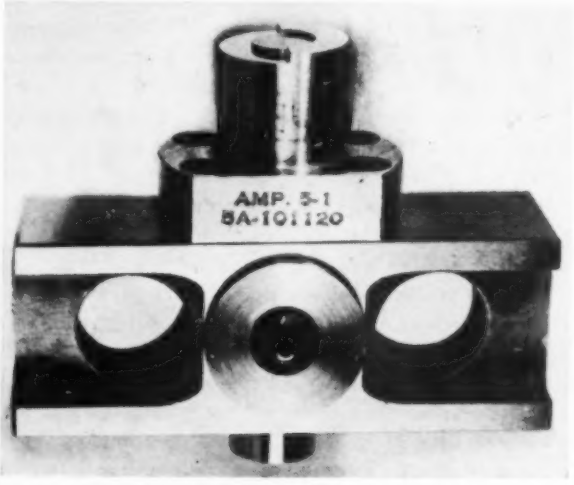
*Courtesy Size Control Co. Modified.



Progressive plug gage, with "Go" and "Not-Go" sections on the same member. This type can gage a "through" hole in one motion, progressing from the "Go" to the "Not-Go" section. (Photo—Winter Brothers Co.)



One of the solutions to close clearance of plug gages. The DuBo gage is designed so that the head is tilted slightly as it enters the bore. If the handle drops freely when the "Go" section is entered, the hole is OK for lower limit. Conversely, if the handle drops freely when the "Not-Go" end is used, the hole is oversize. (Photo—Standard Gage Co.)



Bar type pin gage with 5-1 mechanical amplifier attached. This unit can be combined with a .0005 dial indicator to provide direct readings in graduations of .0001". One of the many ingenious combinations of gage components. (Photo—Holmes Gage & Development Corporation.)

Dial snap gage. Snap gages are often constructed so that a dial indicator may be inserted in place of one set of pins or buttons, to give an indication of the variation from ideal. (Photo—Foster Engineering Corporation.)

Comparison Gages

One of the truisms of gaging is this: "You can't gage what you can't see." With the minimum dimension visible to the naked eye on the order of 1/64" (about 150 "tenths" or 15,000 millionths, if you prefer) the need for amplifying variations from each dimension gaged becomes obvious.

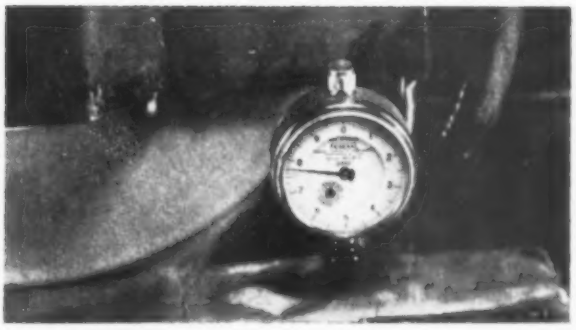
The contact, sensing, or "pick-up" device may be mechanical, pneumatic or electrical; or it may be light rays or sound waves. The amplifying and recording devices use similar means. It is possible to combine these in differing combinations, in a sort of mix-or-match arrangement. Thus it is possible to have a completely mechanical gage, or a mechanical-electric; an air gage, or an air-electric one, and so on.

The limitations of human vision have been mentioned. Perhaps a second limitation, speed of comprehension, should also be mentioned. When the speed of the machine and the gaging become too rapid for human comprehension, then the gage can be set up to take over, signaling adjustments to the machine to compensate for wheel wear and similar factors, and stopping the machine when something goes wrong.

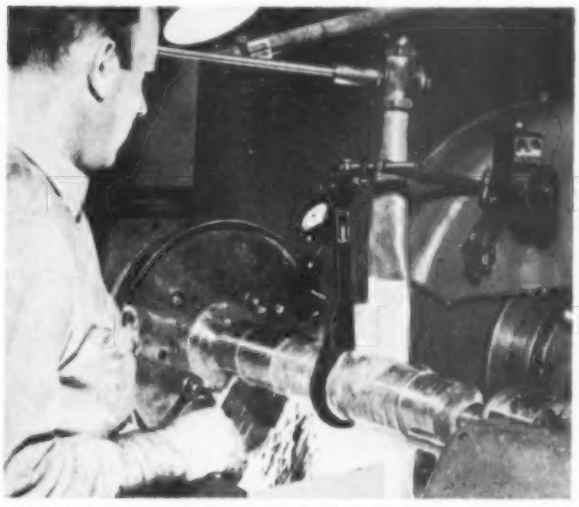
A basic similarity of all of these instruments is that the objective of the inspection is the comparison of an actual dimension with the nominal one rather than the determination of the actual dimension in terms of units of measurement—inches, millimeters, etc. In all of these in which a dial indicator is included, the pointer of the dial is "zeroed in," the tolerance limits are marked in some fashion, and the piece-parts are judged in terms of their variance within or outside of the tolerances.

Mechanical Dial Gages

There is a somewhat confusing situation regarding mechanical amplifying devices. The terms "dial indicator," "dial gages" and "mechanical comparator" appear to be used interchangeably, though the confusion is perhaps more apparent than real. In this treatment,



Dial indicator completely sealed against coolant, dust, oil, fog or other contaminating materials. It is particularly suited for wet grinding operations. (Photo—Federal Products Corporation.)



Grinding gage for cylindrical grinding eliminates need for stopping the grinder to "mike" the workpiece. Can be modified with air gage head and dial (Photo—Federal Products.)

the first term, dial indicator, refers to the recording device only, a clock-like instrument on which the deviations from standard are magnified by a precision rack-and-pinion gear and shown up by the swings of a pointer away from the zero position. There does not seem to be a substantial difference between a mechanical dial gage and a mechanical comparator, though the former term is used for consistency.

While there are many types of mechanical dial gages, some of them standard types and some built for special purposes, they are similar enough in function and application to be considered together.

Basically, each unit consists of a contact which actuates a rack-and-pinion arrangement to turn the hand of the dial, and anvil on which the piece-part rests, and a frame to support the dial and anvil.

Mechanical dial gages find wide usage in industry. While the range of any such set-up is relatively narrow, particularly so when the frame is fixed, dial gages can be arranged to suit a wide variety of conditions. Dial gages can be used, for instance, to measure inside and outside diameters, concentricity, height, depth, straightness and lead of threads.

Once the dial has been "zeroed in" with a master gage or precision gage blocks, it is simple to operate, requiring little skill on the part of the operator. To

simplify readings, the limits may be indicated by adjustable pointers or the non-essential portion of the dial may be masked.

Magnification on the order of 700:1, in comparison with the direct comparison of a fixed gage and the 5000:1 and up to perhaps 100,000:1 ratios for other types of comparators, is an indication of the precision that can be expected.

Applications of mechanical dial gages occur both in process and final inspection. Since it is a matter of manual operation, either applying the gage to the workpiece or the reverse, the production of the instrument is determined largely by the dexterity of the operator. The response of the gage is relatively rapid. This type is almost always separate from the production machine, hence it is not suited to automatic production. The possibility of affecting surface finish by contact is also a limiting factor in their applications.

A dial indicator is very similar to a fine watch. Like watches, they can be shockproof, but they work best when they are handled with care. Wear of the moving parts, with consequent inaccuracy, however, is if anything a greater problem.

Mechanical dial gages and comparators have a wide and varied area of applications. It does not seem, however, that there will be significant increases in the variety of applications. They will be limited by the necessity for manual handling, by the necessity for tangible contact, and by wear factors.

Air Gaging

All of the gages considered so far have required some kind of mechanical contact with the workpiece, with consequent wear and possibility of marring the surface of the piece. In air gaging, however, there is no such contact. The checking is done by measuring the rate at which air escapes through the space between an opening or openings in the gaging head and the surface of the piece-part.

Variations in the rate of air flow are indicated on a columnar measuring device, in the basic air gage. The same type of head may be combined with either an electric or electronic set-up for applications in automated production.

The air and the liquid in the column are the only moving elements in an air gage, hence there is no wear in the instrument. Accuracy remains relatively stable over the life of the gage. While the first cost or air gage heads is greater than that of plug gages, the added life often outweighs the difference.

The surface of the workpiece is not affected. There is no possibility of scratching or marring. As a rule, the surfaces do not need to be cleaned, though in high-precision work this procedure is open to question. Thin and delicate parts can be checked accurately with pressure low enough to prevent warping or deflection. Where tolerances are liberal, high pressures can be used—this assists in the cleaning—but low pressures get the nod when high precision is involved. Another advantage is that air gage heads can often be used in hard-to-reach places where mechanical contacts cannot be used.

Several gaging heads can be hooked up with one column to measure the same number of dimensions simultaneously. Increasing the number of columns, it is possible to check many dimensions on complicated pieces. Such a set-up is obviously for high-volume long-run production, but are becoming increasingly justified as requirements become increasingly stringent. While the air-type gage was first used for internal dimensions, it is today used equally well externally.

Operator skill required is low. Nothing at all is involved in the contact, and the columns can be easily read.

Two limitations in the use of air gages need to be noted, however. The indicator must be close to the gage head. Distances up to twenty or thirty feet between the two have been used, it is claimed, without affecting the accuracy of the instrument, but shorter lengths are usually used. For in-process application this may well be a disadvantage.

The second limitation of the full air gage is that in common with all non-electric devices the feedback to the machine is done by the operators. Thus, while the instrument will indicate clearly and accurately the deviation of dimensions from the nominal, facilitating sorting for selective assembly or the collection of data for statistical quality control, use of this information depends on human beings.

At the moment, the all-air gage may well have come close to its limits in applications. In combination with electronic and electric devices, however, one of the areas to be covered in the concluding article of this series, the possibilities for use in high-speed production appear to be limited only by the imagination of the engineers. • • •

(Acknowledgment is made to Mr. Donald W. Mueller, quality control engineer, The DoALL Company, for review of the above material.)

(Editor's Note: This is the third of a series of articles on gaging for grinding.

The first, in the August, 1959 issue of GRINDING and FINISHING, discussed some of the fundamentals of gaging. The second, in September, dealt with gage blocks. The final article of the series, in November, will cover electric and electronic gaging, optical gaging and sonic gaging.)

Air gage in use for comparing density of grinding wheels, enabling users to better the selection of uniform wheels for super-precise grinding jobs. (Photo—The Sheffield Corporation.)

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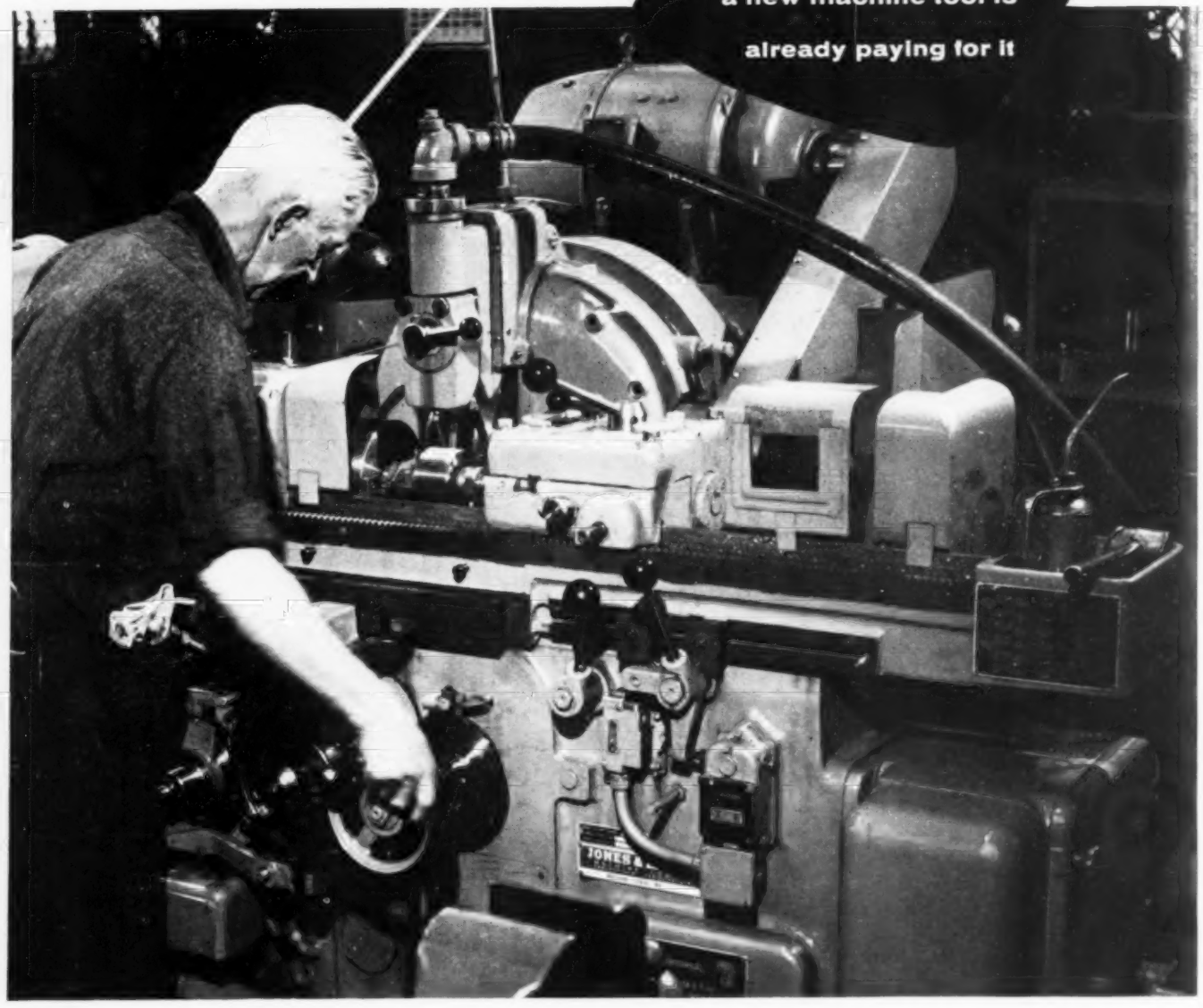

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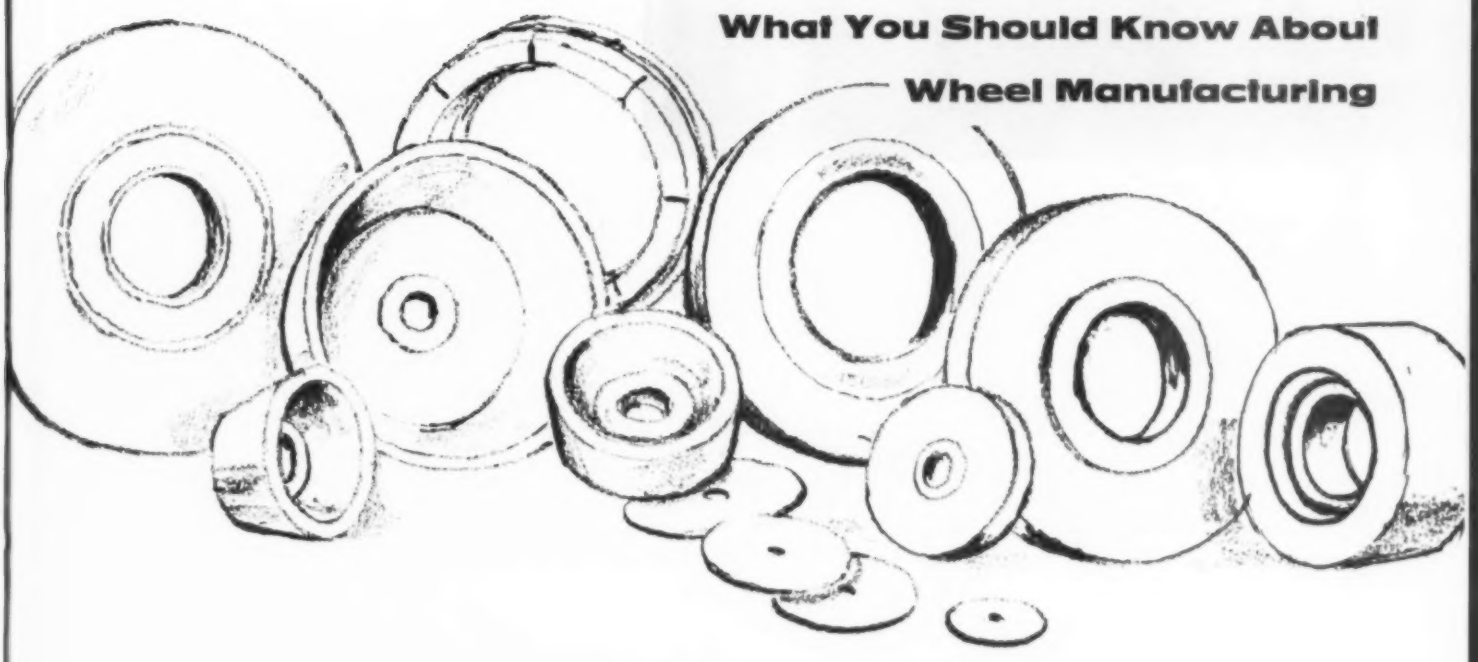

What You Should Know About Wheel Manufacturing

Mixing..Molding..Drying..Firing..Finishing..Inspection..

Each operation in the manufacture of a grinding wheel plays its part in producing the quality that you receive. Covers the "why" as well as the "how" of the steps in a typical sequence. Conclusion of a two-part series.

By M. W. GORMLY
Manager, Grinding Wheel Laboratory
Cincinnati Milling Products Division
Cincinnati Milling Machine Co.

● The process of manufacturing a grinding wheel can be described simply—mix together some abrasive, bond, and water, pack it in a mold, dry it, and fire it. By this process, a do-it-yourself enthusiast with little more than a dish, a spoon, and a small kiln could make a small wheel for slow speed operation. The product, however, would compare to a high-speed precision grinding wheel as an old fashioned wooden bearing would compare to a modern precision anti-friction bearing.

Pre-blending of Ceramic Bond

Manufacture of precision quality grinding wheels requires high standards and stringent controls in all operations beginning with the first, the pre-blending of bond materials. Ceramic bonds are nearly always composed of a mixture of several raw materials which must be blended together before adding them to the abrasive. Although this can be done most economically by simple tumbling or stirring of the ingredients, this does not necessarily produce a uniform blend. Some powdered materials tend to agglomerate into small lumps, which are often many times the size of an abrasive grain. Since they do not always disperse uniformly in mixing with the abrasive, the result can be that whole clusters of abrasive grains are bonded with only a single material instead of with a blended bond. Thus, it is necessary to develop blending equipment or procedures which provide both general stirring and attrition to insure uniform dispersion.

Primary Mixing

Mixing the abrasive with the bond, temporary binder, plasticizer, and other ingredients is usually done at one time although several steps may be involved. The purpose of this operation is to coat each abrasive grain with a uniform layer of bond and, usually, temporary binder, and to plasticize this layer so that the granules will adhere to each other when compacted. Many types of machines are utilized for

Figure 1. Typical milling operation for ceramic-bonded grinding wheels.

Figure 2. Rolling a filled mold for a large grinding wheel into the press.

this purpose, one of the more common being the "bakery" mixer such as shown in Figure No. 1.

Specific mixing techniques vary considerably with the type of equipment and materials used. To outline a typical operation, the first step is the weighing of all ingredients. The abrasive and liquids are then mixed to coat each grain with a film of liquid. If a dry powder temporary binder is employed, it is pre-mixed with the bond. Then, while the mixer is running, the bond is added gradually to the wet abrasive. As the bond layer builds up on the wet abrasive surface, it absorbs the liquid until, when the mix is complete, it is only slightly damp in appearance and the granules will flow freely.

Mixing Defects

An earlier statement, that during the mixing operation the bond layer gradually builds up to the desired thickness on the abrasive may have implied that this process was foolproof. However, a number of defects may be produced by improper procedure in the mixing operation. One of the most frequent, commonly referred to as "bond spots," results from small lumps of powdered bond failing to disperse in the mix. In subsequent firing, the bond usually flows out among the surrounding grains, leaving a small hole.

In very hard wheels, the bond layer on the grain may be so thick that pieces of it are rubbed off late in the mixing cycle. Accumulations may also build up on the mixing paddle to drop off later and cause bond spots.

Following the mixing operation, it is customary to pass the batch through a granulator or coarse screen to break up any soft agglomerates, thus leaving the mixture smooth and free-flowing. In this condition it is ready for the molding operation.

Mold Filling

The first step in the molding operation, filling the mold, must be done accurately in order to insure uniform density in the finished wheel. Non-uniformity may cause not only variation in hardness around the wheel periphery but also out-of-balance, a condition highly objectionable to the user.

In common mold-filling operations, the material falls a distance of 4 in. or more and is slightly compacted when it lands in the mold. If the material is dumped in the mold haphazardly it does not suffice to level it carefully afterward. It is necessary to place the material in the mold uniformly by feeding it in a continuous, controlled ribbon while the mold is rotating, to prevent the condition shown in Figure 3.

Pressing

After the mold is filled it is placed in a hydraulic press, as illustrated in Figure 2. Compression to the desired density requires pressure ranging from about 200 psi of wheel area for very soft wheels to at least 9000 psi for very hard wheels. Under these pressures, the mixture undergoes 15% to 50% reduction in bulk volume. As illustrated in Figures 4 and 5, this volume reduction must take place from both sides of the wheel to produce uniform hardness from side to side.

From the foregoing, it might be assumed that lines of equal density in a wheel cross section would be parallel to the compression plates. Abrasive, however, like other nonplastic granules, tends to pack more densely in planes at an angle to the compressing surface, resulting in a characteristic "X" pattern of slightly higher density. Figure 6 illustrates this density distribution in the wheel section.

Density Control

Wheel hardness can be changed one grade by a density change of as little as 2% or as much as 5%,

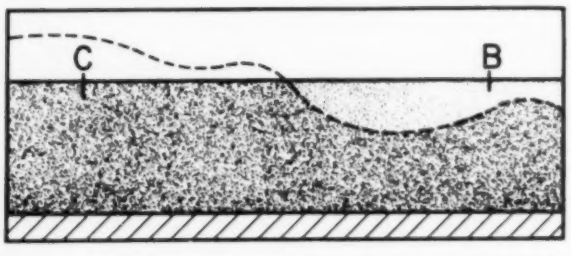

Figure 3. Cross sectional diagram of mold before pressing, showing effects of non-uniform mold filling. Broken line is position of mix before leveling. Material from high area at C has been scraped off to fill low area at B. The transported material is loosely packed, and the finished wheel, for that reason, will be softer at B than at C.

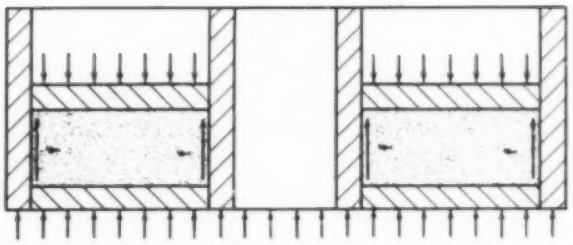

Figure 4. Cross-sectional diagram of wheel mold compressed from one side only. The top of the wheel will be denser than the bottom.

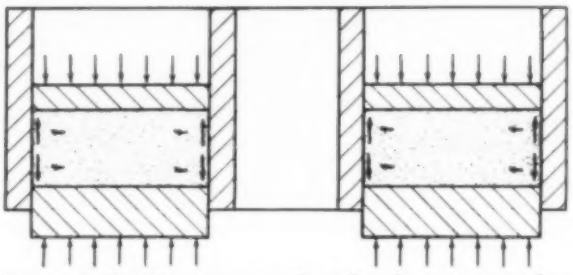

Figure 5. Similar cross section showing compression on both sides. Densities of top and bottom of wheel are equal.

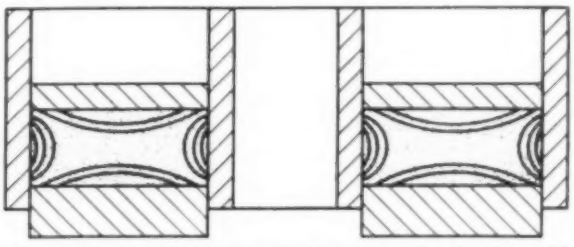

Figure 6. Cross-sectional diagram of wheel mold showing pattern of density distribution by means of density isograms.

depending on the type of formula. In the molding operation the two primary causes of density variation are weighing inaccuracy and thickness errors. These must therefore be rigidly controlled.

DRYING AND FIRING

A freshly-molded ceramic-bonded wheel usually contains water as a plasticizer. This water must be removed from the wheel before it can be placed in the kiln for firing. This frequently requires a separate drying operation.

Drying

In view of the high porosity (usually over 20%) and low water content (under 10%), one could correctly conclude that no problems are encountered in the drying of most ceramic-bonded grinding wheels. Many wheels can be placed directly in a hot dryer, eliminating any need for an elaborate heating schedule. Drying temperatures may be as low as room temperature or as high as 220°F. At the higher temperatures, however, special schedules, equipment, and temperature controls are more likely to be required. A steam-heated oven is shown in Figure 7.

In the easy-to-dry range of products, the economic factor of time is one of the more important considerations. On a single shift operation, overnight drying is most desirable.

Figure 7. A steam-heated drying oven.

On the other hand, if more than 24 hours are required for drying, considerably greater cost is involved since twice as much drying space must be available. Therefore, it is natural to use higher temperatures, if possible, to avoid having drying space tied up for two or more days per cycle where one day might suffice. Since the slower-drying wheels usually present greater problems, especially at higher temperatures, there is a practical limit to the acceleration of drying which can be accomplished by this means.

Firing

Firing temperatures for ceramic-bonded abrasive products vary from about 1000°F to about 2300°F, depending on the type of bond composition used. Most manufacturers use the higher temperatures, and the use of continuous kilns is widespread. Figure 8 illustrates a continuous grinding wheel kiln.

There are two especially significant stages in the heating portion of the firing schedule. In the first of these, organic materials are carbonized and then oxidized to be removed from the wheels as gases. In the second, bond fusion begins as sintering and then melting of the fluxing ingredients followed by solution of refractory ingredients until the bond reaches the desired degree of fusion at peak temperature.

Variations in wheel performance are frequently thought to be due to variations in the fusion process. However, the degree of control provided in modern continuous kilns practically precludes errors of this type. In addition to accurate instrumentation and dependable automatic controls, the very nature of the continuous kiln, employing a specific temperature at each point throughout its length, assures a high degree of uniformity.

FINISHING AND INSPECTION

The operation of truing or finishing a grinding wheel must be regarded as a necessary evil. In most instances, it serves no useful purpose save to correct, or compensate for, the irregularities in wheel size and shape which were introduced in earlier operations. Nevertheless, on many wheel shapes, finishing is the slowest, most costly operation in the entire manufacturing process.

Finishing Sequence

In finishing a straight Type 1 wheel, the first step is ordinarily truing the sides until they are flat, parallel, and within thickness tolerance. This may be done

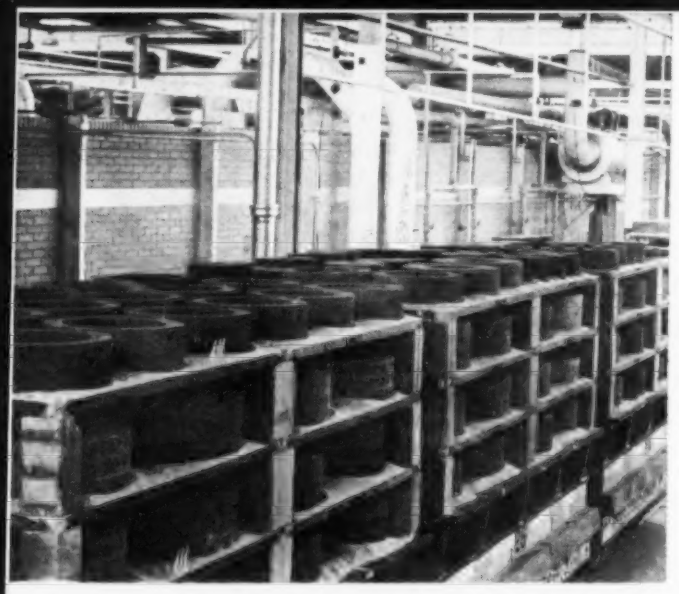

Figure 8. Kiln cars of ceramic-bonded wheels ready to go into the tunnel kiln at extreme left.

by use of a conical steel cutter or another grinding wheel or, most commonly, by forcing the side of the wheel against a rotating table covered with angular steel grit. This latter operation, which is quite rapid, is known as "shot siding" and is shown in Figure 10.

Following the siding operation, the hole is finished to the proper size and perpendicular to the sides. In many wheels with small (under 3 in.) holes, this is done by casting a bushing of lead, plastic, sulfur compound, or other material in place around a mandrel of the proper size. Larger size holes are commonly ground or otherwise enlarged to the proper size, although in recent years wider use has been made of special bushing materials in these large holes.

The final stage in finishing a straight wheel is the truing of the outside circumference, thus insuring a minimum of eccentricity. This truing is usually done with a conical cutter.

Wheel Shapes

As can be seen, the operations involved in finishing a straight wheel are relatively simple and the number of surfaces involved are few. Because of the larger number of surfaces, however, and the different angles between them, other wheel shapes present a different picture. As shown in the diagrams of standard wheel shapes (Fig. 9) wheels with 6 or 8 separate surfaces are common. By molding the special shapes to the approximate size, or by cutting a solid wheel to approximate shape before firing, the final finishing job is slightly easier. While it appears obvious that the logical procedure would be to mold all shapes to approximate size, there are two reasons for considering this impractical in many cases. First, the high mold friction and the irregular shapes make it extremely difficult to achieve uniform density throughout the wheel. Second, the number of sizes and shapes (there are at least 100 dimensional combinations in the Type 11 wheel alone) makes the cost of single-purpose molds prohibitive for any shape not manufactured in substantial volume.

Inspection

The various inspection operations may be divided into three categories: (1) those which insure that the composition of the wheel conforms to that ordered by the customer, (2) those which insure that the wheel meets physical quality standards, and (3) those which insure that the wheel will be safe in operation. This last safeguard is provided primarily by the speed test (Figure 11). By being tested at 150% of its maximum recommended operating speed, the wheel is subjected to centrifugal forces 2¼ times as great as would be met under safe operating conditions.

Dimension Inspection

Physical quality standards are primarily those of size, balance, and "truth." The arbor hole must be held within close limits. If the hole is too small, or the collet too large, the wheel simply cannot be mounted. On the other hand, an oversize hole places the wheel off-center on the spindle, causing the wheel circumference to run eccentrically and creating vibration by imbalance of the wheel-spindle assembly.

Balance Inspection

In order to produce high precision parts it is understandable that vibration must be kept to a minimum. Vibration causes small momentary changes in depth of cut leaving a "chatter" pattern in the work. Wheel imbalance, one of many sources of vibration, must therefore be controlled within close limits.

Low-friction ways and static balancing techniques are common for balance inspection. Recently dynamic machines have been employed for this purpose. While these machines operate on dynamic principles, it is

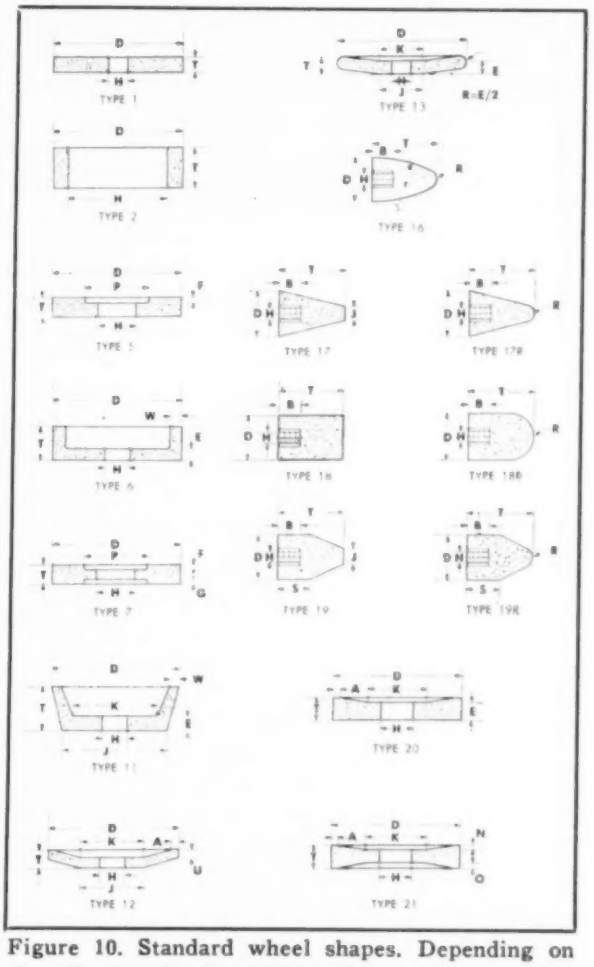

Figure 10. Standard wheel shapes. Depending on size, shape and composition, these may be molded to approximate size and shape or "shaved" (cut to size and shape) before firing. Some must be shaped after firing, a more costly procedure.

Figure 9. "Shot siding" with steel grit on a slowly rotating table trues the sides of the wheel.

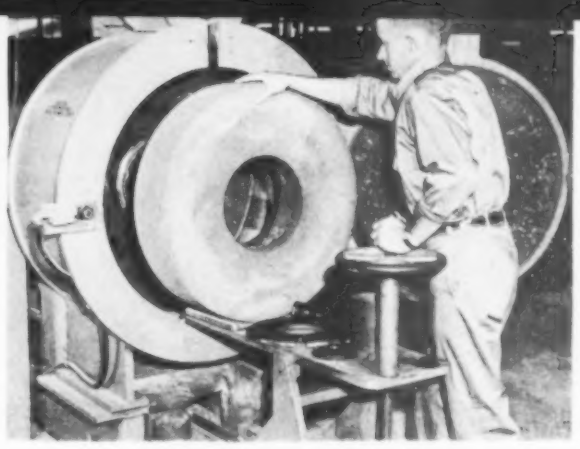

Figure 11. Loading a large wheel into a speed tester, where the wheel will be rotated at 150% of its maximum recommended operating speed.

usually necessary to measure only static balance properties with them. One of these machines is shown in Figure 12.

"Truth," or its converse, "run-out," of the O.D. of a wheel is a measure of the degree of concentricity between the arbor hole and circumference. Both side and O.D. run-out, which must be held within a few thousandths of an inch, are easily measured with dial indicators while the wheel is rotated at slow speed.

Grade Inspection

It is safe to say that control of product hardness or "grade" is one of the most persistent problems of the grinding wheel manufacturer. In high-production grinding operations, machines are often set for the maximum output within the capacity of the wheel. Under these conditions wheel efficiency is quite sensitive and even minor changes in either the workpiece or the wheel may slow down the production line.

Lacking a quantitative definition of grinding wheel grade, the problem of measuring any dissimilarity in hardness between wheels of a given type is a difficult one. Nevertheless, unless a highly refined in-process control system is employed, the manufacturer is dependent upon some form of hardness inspection of the finished product to detect manufacturing errors.

Possibly the oldest, and certainly the most used in past years, instrument for estimating wheel grade is the hardened steel screwdriver-shaped tool, forced, with a slight twisting motion, into the side of a wheel. The degree of resistance to penetration offered by the wheel, conveys an impression of relative hardness to the inspector. Based on this principle, a variety of machines have been developed for measuring penetration resistance. The depth of penetration of a mechanically driven tool is taken as a qualitative measure of hardness.

Advantage is also taken of the fact that a vitrified wheel will vibrate or "ring," when struck, at a frequency which is related to its hardness. One type of instrument induces the wheel to vibrate at its natural frequency and simultaneously measures this frequency, a procedure commonly called "sonic testing."

In a given size of grinding wheel, the natural frequency is affected by a number of factors among which are the type of abrasive, bond composition, amount of bond, density, and degree of vitrification. Since all of these factors also influence grinding performance, the sonic method is useful for quality inspection. Particularly, this method is well adapted to

Figure 12. One type of "dynamic" tester used for location and measurement of static imbalance.

detection of errors in selection of the specific bond used in the wheel as a change in the type of bond often produces a pronounced change in frequency. On the other hand, the sensitivity of the sonic method to variations in density is somewhat less than might be desired. In contrast, some types of penetration tests for hardness seem to be particularly sensitive to density variation but relatively insensitive to variations in bond composition.

As has been indicated frequently in this discussion, grinding wheel quality and uniformity are not generated by inspection nor by any single manufacturing step. Quality is built into the wheel as the materials are put together and processed in each and every operation. Errors and discrepancies may come from many sources; raw material variation, improper selection of ingredients, density variation, and many other factors contribute to the problem. Only by painstaking analysis of potential sources of trouble and by rigorous on-the-spot in-process control can a grinding wheel be made to fill its role adequately as the tool with which precision is attained in the metalworking industry. • • •

(Prepared from a series of articles in The American Ceramic Society Bulletin, February-June, 1958, and republished with their permission.)

Figure 3. Straight wheel guard showing recently approved hinged design for ease of wheel change.

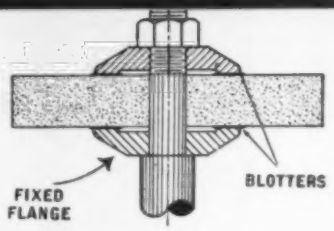

Figure 1. Flanges are equal in outside diameters and relieved to produce equal and opposite bearing areas. Blotters are between wheel and flanges at bearing areas.*

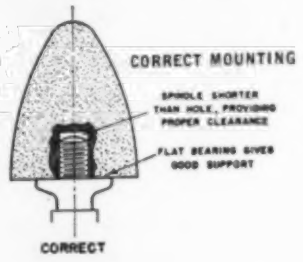

Figure 2. Correct mounting for threaded hole wheels.*

HOW TO APPLY SAFETY TO PORTABLE GRINDING

By D. S. LINTON and RICHARD ALLCHIN
Rotor Tool Co.

● There are two approaches to introducing safety in the use of grinding wheels: (1) minimize the hazards inherent in grinding wheels and (2) introduce protective measures in their use.

Minimizing the hazards inherent in grinding wheels is the wheel manufacturers' problem and they are to be congratulated for vast improvements over the years in materials, methods and attention to quality. But, the wheel manufacturers are not responsible for misuse, mishandling, abuse and carelessness. These are the real problems and the area where protective measures must be applied.

The first step is to know, and understand the American Standards Association's American Standard Safety Code entitled, "Use, Care and Protection of Abrasive Wheels." Then put it to use.

To encourage efforts in the right direction:

1. Put the responsibility for understanding the Code and handling shop instructions under one individual.
2. Add the responsibility to see that the Code is followed, with suitable authority for enforcement.
3. Integrate your safety plan with all interested personnel—buyers, people who specify abrasives, tool engineers, and especially tool maintenance men.

Details and specific answers are easily found in the Code. However, the following points about protective measures which affect portable grinding are frequently not applied adequately, misunderstood or overlooked.

*Illustrations are from the American Standard Safety Code, Oct. 26, 1956.

HANDLING

Protective measures for handling of wheels starts with the inspection when the wheel is unpacked. Visual inspection should be supplemented by the "ring" test—the procedure of tapping the wheel gently with a non-metallic implement to test for the ringing sound of a good wheel, or the dead sound of a bad wheel. Both the visual and "ring" test should be repeated before mounting the wheel on the tool.

If the safety program and the information contained in the Code is to be effective, all personnel involved in handling wheels from the receiving department to the tool operator must use and understand these tests. This group should also realize that a wheel can be easily damaged by dropping, rolling, using poor conveying methods or improper storage.

MOUNTINGS AND FLANGES

The Code regulations are specific on the mounting of grinding wheels on portable tools. Application of these regulations should fall in three areas. In any case, supervisors should be responsible for these regulations. Their normal sequence of work provides the opportunities for their visual inspection of the application of the regulations. The other two groups depend upon the operational procedure of the shop. Some shops insist on the tool crib personnel mounting and inspecting wheels and flanges (see "Air Tool Control Program"—Grinding & Finishing, March '59) while most shops rely on the operator. The effectiveness of their system depends on knowing and applying Code regulations.

We repeat, before mounting the wheel it should be inspected. The wheel should fit freely but not loosely on the arbor. The surface should be clean and blotters (compressible material) should be in place. The nut should be tightened only enough to hold the wheel firmly. Clamping too tight can damage the wheel or bend the flanges. With the spindle threaded so that the nut will turn on against the rotation, drift of the nut will only tighten the nut.

Flanges should be of equal diameter, recess and mate as in figure 1. Maintenance personnel should be impressed with the importance of keeping the flanges in good condition, particularly the faces.

The flange or back plate for threaded blind hole wheels should be flat rather than relieved. Length of the spindle should be checked to be sure it is short enough that there will be clearance at the bottom of the hole as shown in figure 2. The flange can be a standard part of the tool design for this type of wheel or can be a spacer adapter for use on standard straight grinder spindles to give proper support and spindle end length.

WHEEL GUARDS

Recent revisions in the Code have overcome the objections to the use of guards on the grounds of practicality. This has been the area in which the Code is most frequently violated. Wheel guards are also easily controlled through visual check by supervisors.

Figure 3 shows the newly adopted hinged straight wheel guard. Previously the hinge section, shown in figure 4, was held in place by screws or even welded, resulting in considerable trouble changing wheels.

The case for insisting upon the use of guards on cup wheels has been much improved with the adoption of the revolving cup wheel guard, shown in figure 5. It's not cumbersome, is not in the way of the work, and offers no problem for changing the wheel. In fact, with this guard, operators frequently don't realize they are using a guarded wheel. However, one difficulty which does remain is the fit of the guard over the wheel. The Code specifies a maximum of 1/32" clearance between the wheel and the guard. Control of tolerances in the manufacture of cup wheels is difficult, so that this clearance should be checked when mounting a cup wheel. If the clearance is too great, the wheel should be discarded and, on the other hand, it should be discarded if the guard is tight.

The depressed center or disc wheel guard is shown in figure 6. Fairly new in use, it is gaining wider acceptance. It is specified in the Code.

OPERATING

Operating under any set of rules or regulations requires the assignment of the responsibility to competent individuals. It is interesting to note that the Code, in covering this phase, specifically brings into the area of responsibility considerations of lubrication and maintenance of machines and parts. For portable tools, this includes checking spindle speeds with a tachometer and maintenance and adjustment speed control devices.

Frequently overlooked completely is this facet of control. Other than the operator and foreman, who is in a better position to check compliance to many of the Code Regulations than the maintenance man?

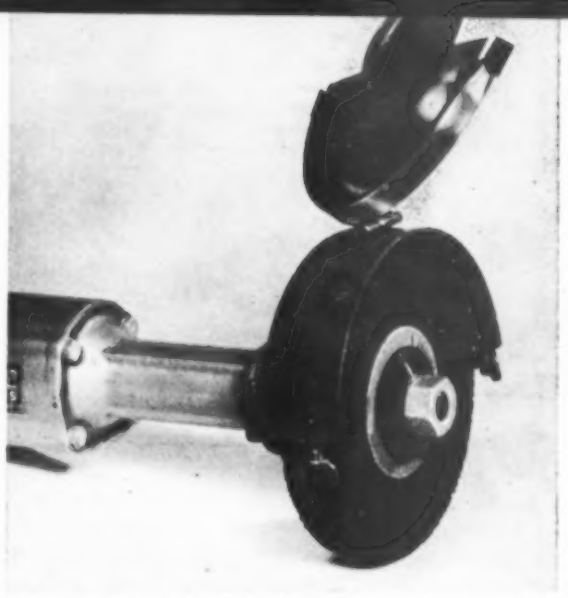

Figure 4. Hinged straight wheel guard opened for easy access to change wheel.

Figure 5. Revolving cup guard wheel shown does not obstruct operators view of work.

Figure 6. Application of depressed center wheel guard as specified in the Safety Code.

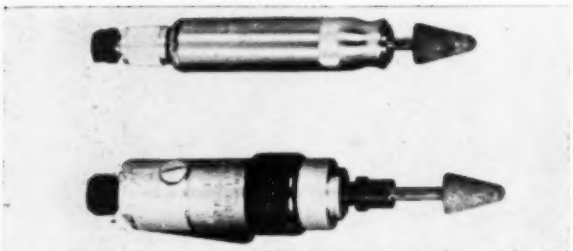

Figure 7. Maximum allowable speed for ½" overhang, A-5 (top) is 40,000 RPM. Maximum for 1" overhang A-5 (bottom) is on a 30,000 RPM tool.

SPEED

Safe portable grinding requires some understanding of wheels and speeds. In the two popular types of bond, there are many types of wheels, each type being in a group classification. Table 1 is a condensed version of Table 18 of the Code Regulation, omitting types of wheels not applicable to portable tool work (mounted points are covered later.) This simplifies the problem by emphasizing the limited shapes, (straight, flaring cup, cup and depressed center) with which we are concerned.

Next, comes the problem of speed—this is somewhat confusing because of the interrelation between surface feet per minute and revolutions per minute. The speed of the abrasive particle on the periphery of the wheel, expressed as surface feet per minute, is what we are interested in for productivity. Generally, the higher the surface feet per minute speed, the greater the amount of work done. But for each classification of wheel type of bond, this maximum speed is a constant as shown in Table 1.

On the other hand, portable tools are rated in revolutions per minute. For safe portable grinding with a given wheel, the safety measure is to convert surface feet per minute for that wheel to revolutions per minute and then put the wheel on the correct portable tool. Making the conversion requires the determination of the type of wheel and bond, then using Table I to find maximum surface feet per minute speed. With the allowable surface feet per minute determined and knowing the diameter of the wheel, the conversion chart shown in Table 2 is used to find the maximum revolutions per minute. Table 2 is condensed, to show only high strength bonds most used on portable tools.

For example, a user has a straight wheel, high strength organic bond, 6" in diameter. Table 1 shows for Classification 1, Type 1, Straight Wheels, a high strength organic bonded wheel can run at 9500 sfpm. As shown in Table 2, for 9500 sfpm, the 6" diameter wheel can run at 6048 revolutions per minute.

Proper use of this protective measure requires suitable instruction and constant follow-up to see that it is used. Data, such as Tables 1 and 2 should be posted in the shop and tool crib at or near the point of use for constant check up. The need for more than one chart or table may mean too much of a handicap for effective use. The celluloid conversion discs distributed by wheel manufacturers seem to be little more effective.

Rather than using a chart showing wheel type and allowable speeds in surface feet per minute and a separate conversion chart for surface feet per minute to revolutions per minute, the two can be combined. Most shops use a limited range of wheel sizes and tool speeds so that the combination chart can be made up within practical space size of Table 3 shows what such a chart might look like. Note that wheel size specifications are shown so that this might be used as a base for reordering wheels. As an added twist for control, the last column shows the color of tool to use wheel on; this can be used where it is practical to paint tools different colors to give a color code for r.p.m. rating.

Along with the speed control of wheels goes speed control of tools. It is questionable how many users of portable tools are even aware that the Code spells out requirements for r.p.m. checks and adjustment of tools, to include maintaining a record of the checks. Regardless of good or poor tool maintenance, r.p.m. can't be checked without some measuring device.

MOUNTED POINTS

For any mounted point of a given (1) shape and size, (2) mandrel size and (3) overhang (the 3 Safety Code factors) there is a maximum operating speed shown in a table of the Code.

Pointed out in figure 7 is the problem of overhang. Overhang is the distance from the front end of the collet or chuck to the base of the abrasive form, or the abrasive nearest to the collet or chuck. As this distance increases, the maximum allowable speed is reduced. In the illustration, for the A-5 shape shown,

TABLE 1 - STANDARD MAXIMUM SPEEDS FOR PORTABLE ABRASIVE TOOLS

Classification No.	Type of Wheel	Vitrified & Silicate Bonds			Organic Bonds		
		Low Strength sfpm	Medium Strength sfpm	High Strength sfpm	Low Strength sfpm	Medium Strength sfpm	High Strength sfpm
1	*Type 1 - Straight wheels	5,500	6,000	6,500	6,500	8,000	9,500
3	* Type 11 - Flaring cups	4,500	5,500	6,000	6,000	8,000	9,500
4	* Type 6 - Cup wheels	4,500	5,000	5,500	6,000	8,000	9,500
8	Type 27 - Depressed center reinforced wheels				9,500	12,000	14,200

* Standard Shapes

the maximum allowable speed for a ½" overhang is 45,000 r.p.m. and it is on a 40,000 r.p.m. tool. The maximum allowable speed for a 1" overhang is 33,000 r.p.m. and it is on a 30,000 r.p.m. tool. Note that even for the same mounted point, different tools are required with the different overhang.

Probably the best place to introduce safety measures here is in the control of buying or specifying the mounted points and tools to be used. Since the operator, or even a foreman, will grab the nearest mounted point and the nearest tool, it would seem sensible to furnish to him only mounted points and tools which can go together in a safe combination.

For instance, if there was an application which required ½" and 1" diameter W shapes and a pointed end A shape. The control point should collect the data. Suppose the available tool has a ¼" collet and it is rated at 30,000 r.p.m. The following are some mounted points which will fit the job and equipment (with "buy" after the items to use).

Shape No.	Arbor	Diameter	Length	OH	Max. Speed	
W222	¼"	1"	2"	½"	15,000	
W221	¼"	1"	1½"	½"	19,120	
W220	¼"	1"	1"	½"	25,500	
W219	¼"	1"	¾"	½"	35,100	Buy
W189	¼"	½"	2"	½"	24,000	
W188	¼"	½"	1½"	½"	30,370	Buy
A-1	¼"	¾"	2½"	½"	19,800	
A-11	¼"	13/16"	1¾"	½"	27,520	
A-12	¼"	11/16"	1¼"	½"	48,000	Buy

Notice that in the last case the actual working speed will be 30,000 r.p.m., whereas the allowable is 48,000. This is an operating inefficiency distasteful to the good shop man, but the only practical safe approach.

TABLE 2—CONVERTING SURFACE FEET PER MINUTE TO REVOLUTIONS PER MINUTE (FOR HIGH STRENGTH ORGANIC BOND)

Diameter of Wheel In Inches	Peripheral Speed in S. F. P. M.	
	9500	14,000
	Revolutions per Minute	
1	36,287	53,474
2	18,143	26,737
3	12,115	17,826
4	9,072	13,368
5	7,258	10,696
6	6,048	8,913
7	5,138	7,640
8	4,535	6,685
9		5,940

As a more complicated example, suppose an operator is working with a W187 mounted point (plain shape, ½" dia. x 1" long, ¼" mandrel), using a ½" overhang. He has it on a tool rated at 40,000 r.p.m. (The Code table shows an allowable speed of 40,500 r.p.m.) Also, he has a selection of other shapes on his bench, and now selects an A-1 shape to complete the job with the same 40,000 r.p.m. tool. But the A-1 shape, ¼" mandrel, ½" overhang, according to the Table, should not operate over 19,800 r.p.m. The operator should then check the allowable speed for the A-1 shape before using it. This is done by determining the three Safety Code factors, and using the proper chart. Next he should have a second tool available to put the A-1 shape on.

PLAN FOR SAFETY

And so it goes with portable grinding—recognized hazards, not very complex, but difficult to control. Nevertheless, the aids are there to use and with some honest effort, the hazard can be reduced • • •

TABLE 3 EXAMPLE: COMBINATION OF PERIPHERAL SPEED AND REVOLUTIONS PER MINUTE CHARTS FOR TYPES OF WHEELS IN USE

Classification No.	Type of wheel	Bond	Wheel Size Specs.	Revoltuions per Min. for S. F. P. M. of: 9500 sfpm	14200 sfpm	RPM Color Code of Tool
1	Type 1 - straight wheel	Organic, high strength	4 x 1 x 5/8	9000	-	red
		" " "	6 x 1 x 5/8	6000	-	grey
		" " "	8 x 1 x 5/8	4500	-	blue
3	Type 11 - Flaring cup wheel	Organic, high strength	6 x 4 3/4 x 2 x 5/8	6000	-	grey
8	Type 27 - Depressed center reinforced	Organic, high strength	7 x 1/8 x 7/8	-	7200	green
			7 x 1/4 x 7/8	-	7200	green
			9 x 1/4 x 7/8	-	6000	grey

NOTE:

Straight wheel:	4 x 1 x 5/8	Std. max. is 9072 r. p. m.	; tool rated at	9000 r. p. m.
" "	6 x 1 x 5/8	" " " 6048 "	; " " "	6000 r. p. m.
" "	8 x 1 x 5/8	" " " 4535 "	; " " "	4500 r. p. m.
Flaring cup wheel:	6 x 4 3/4 x 2 x 5/8	" " " 6048 "	; " " "	6000 r. p. m.
Dep. center wheel:	7 x 1/8 x 7/8	" " " 7740 "	; " " "	7200 r. p. m.
"	7 x 1/4 x 7/8	" " " 7740 "	; " " "	7200 r. p. m.
"	9 x 1/4 x 7/8	" " " 6020 "	; " " "	6000 r. p. m.

28% extra performance with this standard cup wheel with "built-in guard"

REPORT

PART—Various forms of structural steel

OPERATION—To smooth rough welds

PROBLEM—To reduce costs of operation

SOLUTION—Standard DS31714 Cup Wheel, 6" x 2" x 5/8", TA163-R-B5 in portable air surface grinder

RESULT—28% longer wheel life

In a test conducted recently by a large fabricator of structural steel, this *standard* cup wheel averaged 28% more life on rough weld grinding. This resulted in complete customer satisfaction and acceptance of this wheel for this operation.

This portable cup wheel with its built-in steel guard has been thoroughly field tested under the most rigorous conditions. It has been adopted by CARBORUNDUM as a "National Standard" because of its optimum performance.

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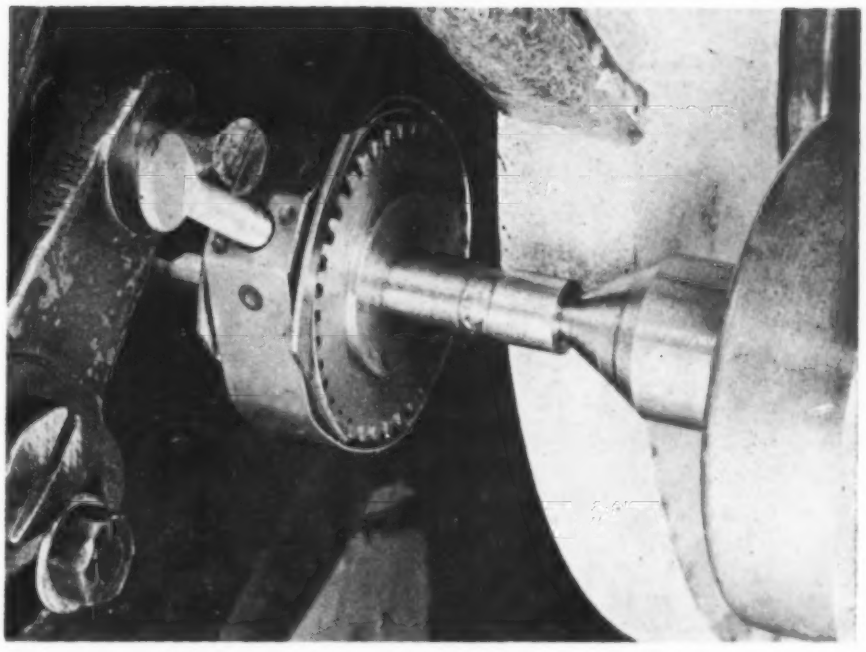
Ideas from the Shop

HOSE CLAMP DRIVES SHORT WORK ON CYLINDRICAL

By H. J. GERBER

• Sometimes a cylindrical grinding job is encountered which is impossible to drive between centers with standard dogs. An example is the illustrated integral pinion shaft. In cases of this sort a common hose clamp will often do the trick. It is not as bulky as a driving dog and therefore will not protrude into the side of the wheel or wheel flange. It also has the added advantage of being able to grip the work without the possibility of damaging a finished surface.

These clamps are readily available in a large number of sizes and we keep a selection of them hanging on our grinder tool panel along with the conventional dogs.



Hose clamp holds integrated pinion shaft on cylindrical grinder. Not bulky, it grips work without damaging finished surfaces.

POSITION OF DIAMOND FOR TRUING SURFACE GRINDER WHEEL

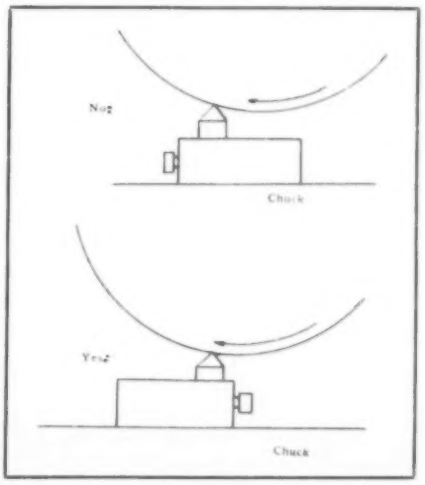
By BUCKLEY SULLIVAN

• It is a good thing occasionally to remind grinder hands of the old shop rule relative to the position of the diamond and the grinding wheel, when truing a wheel on a surface grinder.

The diamond holder should always be positioned on the magnetic chuck with its center away from the wheel, and with the wheel rotating toward the holder, as illustrated in the lower sketch.

If the relative positions of wheel and holder are reversed, as in the upper sketch, there could be trouble in case of power failure or when pressure on the diamond is sufficient to pull the holder away from the chuck.

The wheel might be broken or the diamond ruined. The surface of the chuck could be gouged. In severe circumstances the grinder spindle could be sprung or the operator injured.



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Ideas from the Shop is basically the same department that we used to call **SHOP HINTS**—practical suggestions from shop men to other shop men, the unwritten short cuts that every shop develops. Only the name has been changed. So. . . **What's YOUR Idea?** Our other readers would like to know, and you'll be paid for it to boot. Send your ideas to IDEAS EDITOR, GRINDING and FINISHING, Hitchcock Publishing Co., Wheaton, Illinois.

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Unit Collection Saves Swarf

● At the Chrysler Corporation automatic plant in Kokomo, Indiana, the cost of diamond grinding operations is being cut by an efficient new unit system of collecting dust from diamond grinding wheels.

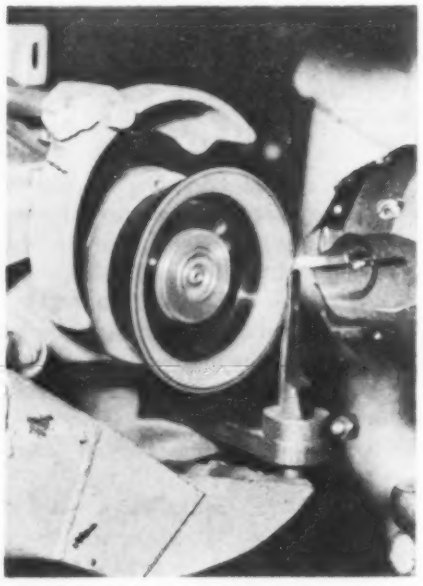
These compact units, mounted above or alongside the grinding machines, are tied into a central dust removal system which switches in by means of by-pass valves when other grinding wheels are in use.

A cyclone separating action in each unit deposits the diamond bearing dust in a clear plexiglas container at the top of the collector. The dust level can be checked visually and the containers emptied as necessary. For emptying the dust, the clear containers are easily removed and replaced.

The individual dust collectors occupy only 14 inches by 22 inches of floor space. When they are mounted above the grinder, no floor space is required.

The cost of a single collecting unit is about the same as the average cost of a diamond grinding wheel.

The value of diamond dust recovered by the collectors soon equals the original cost of the salvaging equipment. Torit estimates that with the individual collectors, about one-tenth of the value of every diamond wheel can be regained. • • •



SINGLE COLLECTOR. A receiving hood located below this cutter grinder catches diamond bearing dust which is sucked into an overhead collecting unit.

Home-Made Rig Automates Sanding

Belt grinder mounted side-saddle on lathe, plus simple control gadgets, doubles production in turning and sanding textile bobbins, could cut costs in finishing similar tubes or cylinders.

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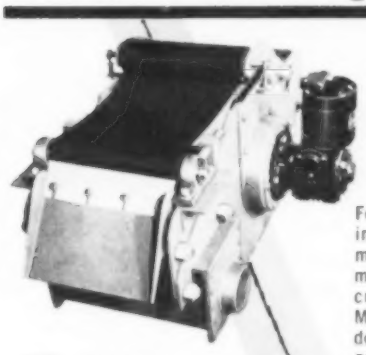
● Taylor Fibre Co., Norristown, Pa., has found a way to double production, halve equipment requirements, and improve quality in turning and sanding textile bobbins.

The production procedures it has developed may be a cost-saver in turning and finishing any cylindrical part made from laminated plastic tubing or rods.

What Taylor Fibre has done, basically, is to team up two operations in one piece of equipment—and add

Sidesaddle mounting of belt grinder (back of lathe) eliminates second lathe, permits automatic turning and sanding of plastic tube which operator is mounting. Finished tubes in foreground.

GALE OFFERS COOLANT CLEANING AND OIL SEPARATION EQUIPMENT for the metalworking industry



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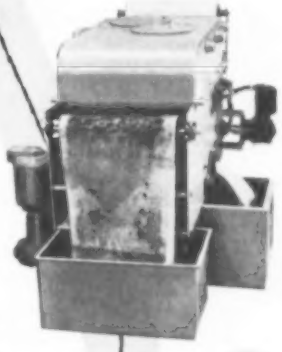

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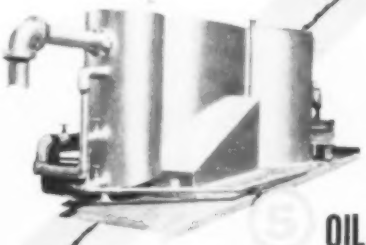

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Free un-emulsified oil and grease contamination in liquids is eliminated by the "GALE" Interceptor-Separator. Oils are removed and separated liquid is discharged.

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Home-Made Sanding Rig
(continued)

relatively simple controls for automatic sequencing. A standard metalworking lathe, a homemade belt sander, plus a few micro switches, bellows air cylinders and other control items turned the trick.

The lathe-sander combination automatically faces the ends to specified length and makes them parallel; turns the outside diameter to very closely prescribed specs for concentricity and size, and sands the OD for the desired finish.

Use of an expanding mandrel to hold the tubing on center permits quick adaptability of the combination equipment to any tube length and diameter within the limits imposed by lathe size. Adaptability of the combination equipment, reports Taylor, are:

Doubled production

Bobbins were formerly cut to length and end-faced for parallelism before the OD was turned down for desired concentricity on a lathe. They were then transferred to a second lathe for hand-sanding. Production rates are increased 100 percent by the new method.

Halved lathe requirements

The second lathe formerly required for hand-sanding is now freed for other work. Extra handling is also eliminated.

Better finish

The timed, automatic application of the sanding belt gives more consistent results than hand application, provides the surface texture (not too rough, not too smooth) needed for textile bobbins.

The parts—produced from Grade XX (bobbin) paper-base, phenolic tubing—must meet exacting requirements for roundness, concentricity and finish. Turning and sanding was the only feasible way to meet the specifications. Sizes of bobbins finished on the lathe range up to 12 inches in length and up to 9 inches in OD.

A 9-inch Elgin lathe is used. To start the automatic sequence, the operator puts the bobbin on the expandable mandrel between lathe centers, then pushes his start switch. The machine centers the piece, starts turning, faces the ends (optional) and turns the OD. A stream of air clears the work area of the continuous stringers produced in turning the OD. The belt sander then moves forward, sands the OD, retracts, and shuts itself off.

The complete operation takes about 60 seconds. The operator checks each bobbin for out-of-roundness by turning it under a dial indicator accurate to .0005 inch.

Utilizing this idea in other applications is primarily a matter of changing the belt to match the material being ground. Using a belt as wide as the work-pieces will eliminate the necessity for providing any means of reciprocating either the belt or the piece, making a simpler set-up. • • •

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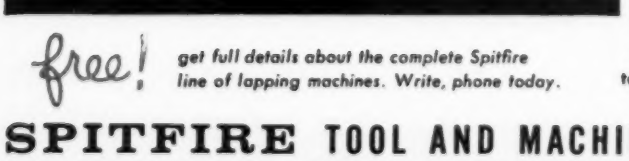

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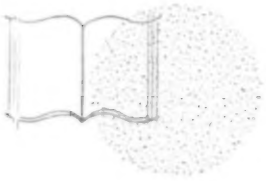
"I ground mine."



Literature

1. Snagging Wheels for the Foundry. This four page bulletin describes grinding wheels for rough snagging operation on floor stand, swing frame and portable grinding machines, including straight wheels, cup wheels, depressed center wheels and abrasive cones. Included is information on improved resinoid bonded wheels with special additive that provides an internal lubricant. A new V9 vitrified bond for Electrolon silicon carbide abrasive for gray iron castings is also described. Simonds Abrasive Co., Philadelphia, Pennsylvania.

2. The New International Inch. An eight page bulletin describes why, what the affect will be and answers questions about the international inch. Included is a chart on the length-tolerance significance of the international inch and also a chart on temperature conversion. Pratt & Whitney Co., Inc., West Hartford, Conn.

3. Cylindrical Grinding Wheels. A four page bulletin describing cylindrical grinding wheels explains the desired characteristics of cylindrical wheels. Recommendations for many cylindrical grinding operations from alnico to valve seats and worms are included in chart form. Macklin Co., Jackson, Mich.

4. Acme Automatic Deburring Machines. A sixteen page brochure describes the many means of deburring employed by Acme machines from wire brushes to grinding wheels. Illustrated and described are the machines for deburring spline shafts, jet engine blades, motor rotors, chain sprockets, die-cast bodies, washers and bushings. Acme Mfg. Co., Detroit, Michigan.

5. Basics in Coated Abrasives. Recommendations for the use of sheets, belts, discs and rolls in the metalworking trades are described in this four page bulletin. Grain, backing, bonding and coating are discussed and explained. Carborundum, Niagara Falls, N.Y.

6. Dust Collector Accessories. Information sheet includes illustrations, drawings, and specifications of an unusually wide range of accessories for both Torit cyclone and cabinet cloth filter type dust collectors. The accessories will help increase efficiency and simplify installation by achieving practically "tailor-made" installations at minimum cost. Torit Mfg. Co., Dept. KP-3, Walnut and Exchange Streets, St. Paul, Minnesota.

(See Number 1)

(See Number 2)

(See Number 3)

7. Drill Point Grinder. Specifications, production rates and prices for the new Morse Twist Drill drill point grinder are included in a four page bulletin. This machine is reportedly capable of grinding any type of drill point at higher speeds and to closer tolerances than existing units. Morse Twist Drill and Machine Co., New Bedford, Mass.

8. Automatic Polishing and Buffing Machines. Five loose leaf sheets describe the specifications of continuous rotary automatic, Ahlco belt heads, horizontal return-type straight line conveyor, hand buffing lathe, and a belt and buff stand combination. Arthur H. Losey Co., Jackson, Michigan.

9. Vibratron. The new Roto-Finish Vibratron precision finishing machine is described in a four page bulletin. Included is a diagram illustrating how the action differs from conventional barrel finishing equipment. Along with design features and detailed information on how the machine works are eight illustrated case histories showing before and after photos, detailed information, time cycles, and finishing results. Roto-Finish Co. Kalamazoo, Michigan.

10. Pneumatic Tools. Dotco's new "Series 2" pneumatic tools with larger more powerful rotary vane motors are fully detailed in its latest bulletin 102. Designed for heavy-duty metal and plastic finishing work these tools operate with a maximum run-out to .0005 on all collet types. Sealed front ball bearing and micro-bronze muffler-filter keep out dirt. Tools are available in straight or right-angle, for manual or machine operation, with lever or button throttle control. Doeden Tool Corp., Sherwood, Ohio.

(See Number 7)

To obtain literature use Reader Service cards on page 57. Circle number on card which appears at the start of the paragraph describing the literature you request.

FREE LITERATURE *continued*

11. Dial Indicators. Four page bulletin describes Federal Miracle Movement Dial Indicator. Explained are the advantages of this new development which greatly extends life by providing substantially increased resistance to wear and shock. Federal Products Corp., Providence, R.I.

12. Grind-O-Flex Wheels. Type, "BL" Grind-O-Flex wheels of 14" and 16" diameters and widths from 3" to 6" are described in this eight page bulletin. Included is a description of loading the reuseable hub and price lists of hubs and loadings. Merit Products, Inc., Los Angeles, California.

13. Collected Comment. Ben P. Sax, president of American Buff Co. has put in a Reader's Digest format reprints of his articles which have been most-often-requested. The articles selected are warm, sincere and thought-provoking comments on the human aspects of the business scene. American Buff Co., Chicago, Ill.

(See Number 10)

14. Wet-Blasting Abrasives. New price list of available abrasives used in the wet-blasting process includes a wide variety of abrasives—quartz, silica, novacite aluminum oxide, silicon carbide, etc. —ranging in particle size from 75 to 5000 mesh. Pressure Blast Mfg. Co., Inc., Manchester, Conn.

15. Oscillating Belt Grinder. Four page bulletin describes the new Tri-Matic oscillating belt grinder. Four important features of the workhead, conveyor, frame and control cabinet are covered along with the Aer-Tronically control belt oscillation. Sales Service Mfg. Co., St. Paul, Minn.

16. Automatic Saw Blade Grinder. Tempo Type AS6-10 automatic saw blade grinding machines are described in a four page bulletin. This machine grinds circular saw blades with bond grinding wheels and is capable of grinding alternately high and low with the higher roughing teeth beveled on both sides. W. Von Arnauld Co., Oakland, N.J.

(See Number 11)

17. Barrel Finishing Separating Equipment. Details and specifications are contained in a four page bulletin on Techline separating equipment. New model 3550 magnetic separator for parts which make it impossible for mechanical separation and model 2448 motor driven mechanical separator featuring Techline's exclusive steel plate punched with round holes are described along with separating screens for all sizes of conventional media hoist pans. Techline Division, Wheelabrator Corp., 1169 Ave. V, Vicksburg, Michigan.

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Grinding and Finishing

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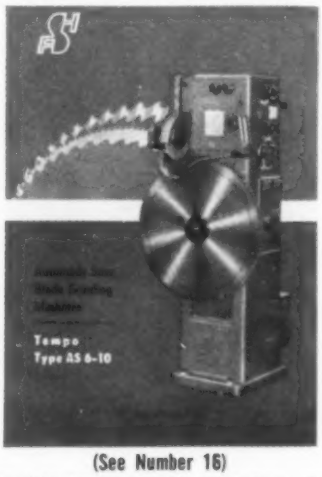
18. Precision Measuring of Odd or Thin Material. Three brochures covering precision motorized and manually operated dead weight micrometers for the most accurate measurement of paper, foil, and rubber sheet materials, according to rigid ASTM and Government Specifications also include interesting coverage of special purpose instruments for internal and external measurements. Twenty-four thought provoking methods of solving difficult and unusual measuring problems are included on a separate sheet. Testing Machines, Inc., Mineola, N.Y.

19. Liquid Compositions for Buffing. Eleven special liquid compositions for buffing and coloring operations are covered in this bulletin. Grade evaluations on Liquid Tripoli and Liquid Stainless Steel Compositions are featured as well as pictures of the Stevens Customer Laboratory Service facilities which are available to all users of buffing and polishing compositions. Frederic B. Stevens, Inc., Detroit, Mich.

20. Collets. New 24 page catalog illustrates and describes Sutton Collets and Feeders for use on automatic screw machines, turret lathes, engine lathes, and grinding machines. Cross-sections and descriptions accompany each type of collet. Several pages are devoted to illustrating and describing special tools designed to handle unusual work-holding problems. Sutton Tool Co. Sturgis, Mich.



(See Number 16)

21. Handbook on Metal Cleaning. "Some More Good Things to Know About Metal Cleaning," published by Oakite Products, Inc., contains 28 pages of information developed over the company's fifty years in the metal cleaning and treating fields. The booklet discusses chemistry and techniques of cleaning; tank cleaning, with suggestions for tank design and layout and selection of detergents; electrocleaning; barrel cleaning; machine cleaning; and ultrasonic cleaning. Oakite Products, Inc., 157 Rector St., New York 6, N.Y.

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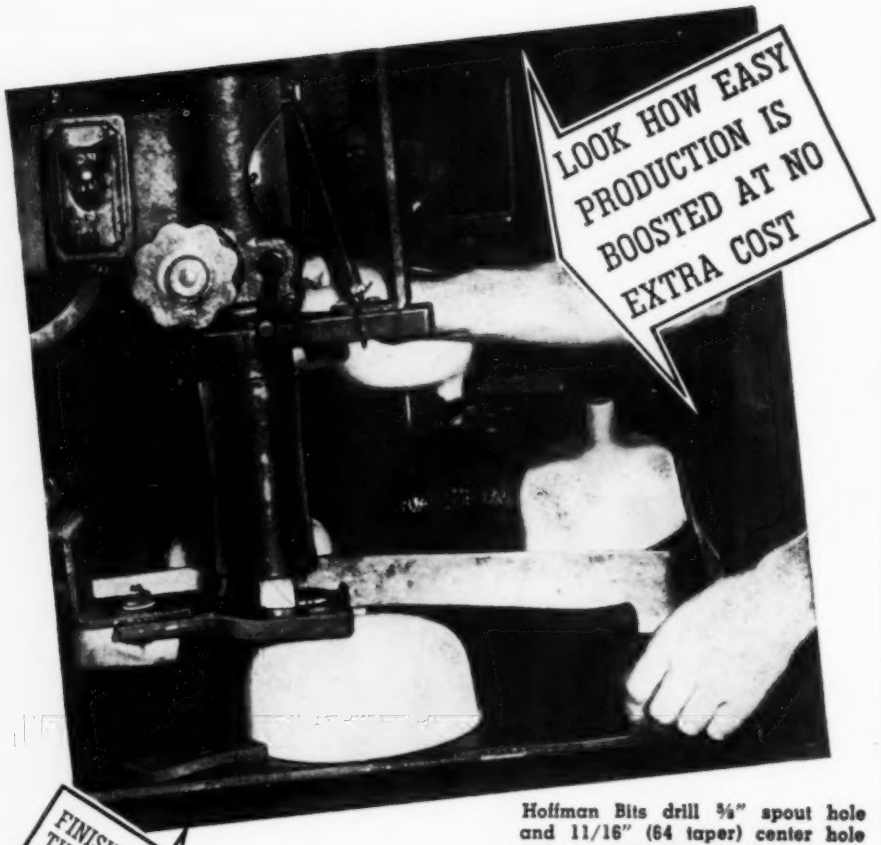

Hoffman Bits drill ⅜" spout hole and 11/16" (64 taper) center hole with just one simplified set-up.

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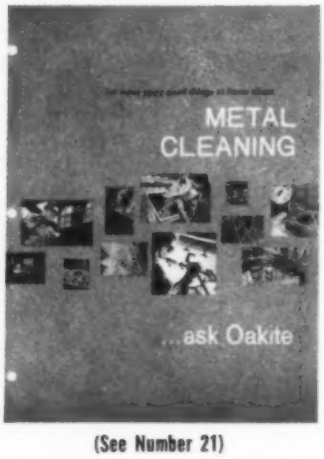
FREE LITERATURE *continued*

22. Replacement Formula Book. The second revised edition of the booklet which describes the Jones & Lamson "Avoidable Costs" replacement formula is now available. The formula, introduced several months ago, has met with enthusiastic approval from many segments of industry. This edition incorporates new, revised projection factors. Jones & Lamson Machine Company, Springfield, Vermont.

23. Wheel Grading Recommendations. Over 1600 experienced-tested abrasive wheel recommendations for grinding everything from Aget to Zirconium are set in alphabetical order in this new 57 page Specifications Catalog. Material, work, operation with their respective recommendations on abrasive, grit, grade and bond are listed for quick reliable reference. Carborundum Co. Niagara Falls, N.Y.

24. Gaging. Gaging Newsette issued from time to time covers gaging developments and helpful hints for gaging practices. The September issue describes P.D. measurement, reverse dials, factory service tool and cam checking fixture. Standard Gage Co., Inc., Poughkeepsie, N.Y.



(See Number 21)

25. Filter Element Materials. Two page bulletin describes seven basic filter element materials and various series of filter assemblies and replacement elements. Each of the filter element materials are illustrated by two photographs

Reprints Available

Better Diamond Dressing for Precision Grinding
Effects of Materials on Snagging Wheel Performance
Flap-Type Coated Abrasive Wheels
How Good Are Man-Made Diamonds?
When and How You Can Use Crush Form Grinding
Centerless Grinding 35c
Organizing and Operating a Precision Barrel Finishing Dept. 35c
Standard Time Data $1.00

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Wheaton, Illinois

including photomagnifications. The materials discussed provide particle size control from ½ to 250 microns in temperature ranges from minus 350F to plus 1500F. Bendix Filter Div. Bendix Aviation Corp., Madison Heights, Mich.

26. Microfeed for Cylindrical Grinders. Bulletin describes new Landis wheel feed called Microfeed. The new wheel feed is an ultra-fine feed to final size that cancels grinding feed variables. Landis Tool Co., Waynesboro, Penn.

Coated Products Grain Grading. U.S. Department of Commerce has released their Commercial Standard CS217-59 entitled "Grading of Abrasive Grain on Coated Abrasive Products." This 39 page booklet covers classification, control definitions, grading limits, grain recovery procedure, sedimentation grading, and grading procedure. Write to the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. Price 15 cents each.

American Standard Cut and Ground Threads. The present revision of the "American Standard Taps—Cut and Ground Threads, B5.4-1959" is a 48 page booklet which includes tap styles, nomenclature and definitions, thread series data, a standard system of marking, and dimensional and tolerance tables for right hand thread taps of the following types: hand, machine screw, spiral pointed, helical (spiral) fluted, tapper, nut, pulley and pipe. Copies cost $2.50 from the American Standards Association, 70 East 45th Street, New York 17, N.Y.

Portable Air Tools. New 91 page book entitled "How to Choose and Use Portable Air Tools" includes 14 articles describing various aspects of portable tool applications. Basic objective of the handbook is to help the reader get more productivity from his portable tools and thus cut costs. The book does not try to examine very large installations of portable tools with the resultant large dollar savings, rather average situations that are practical. The handbook is free, if requested on company letter head, by writing The Rotor Tool Company, Dept. GF, 26300 Lakeland Blvd., Cleveland 32, Ohio.

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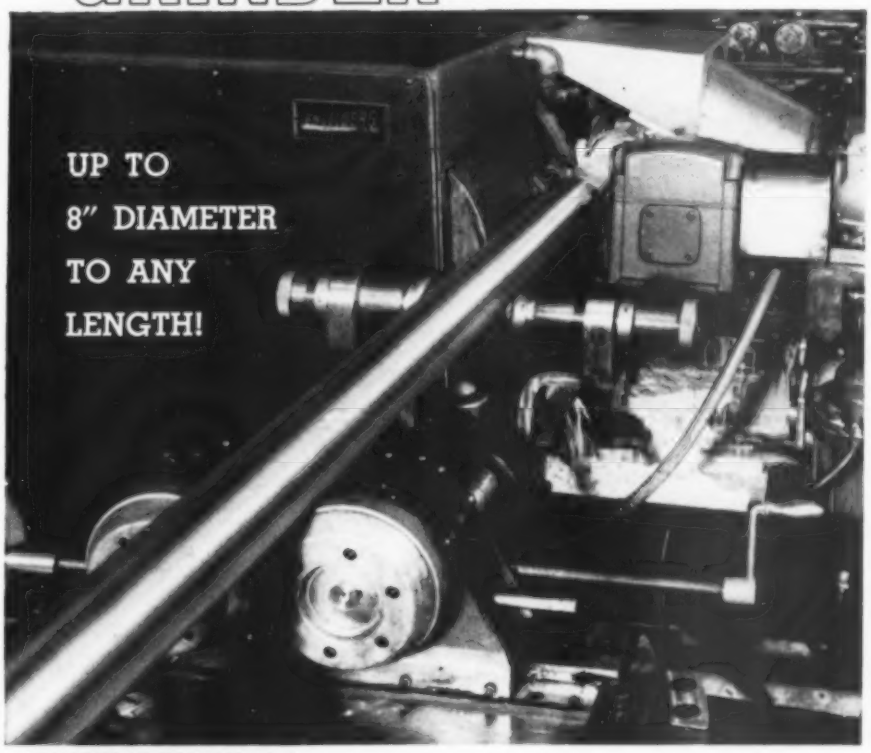

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Loaded with "firsts," the Engelberg 8132-HD now makes possible exceptionally heavy single pass stock removal, extremely fine finishes, close tolerances on any rod or tube stock.

New large workpiece capacity—precision grinds and finishes any length, takes diameters from 1" to 8".

New powered outboard support system—main power unit controls synchronized "slave" units for variable through feed rates.

New automatic reverse feed—microswitch controls automatically change helix angle of outboard support power units and regulating wheel to reverse feed direction for multiple through feed passes; eliminates intermediate material handling.

New highs in production—Ex: 416 stainless steel bars 5.060" diameter, 20' length; removal .018" stock per pass at feed rate of 70" per minute. 1020 steel tubes 6¼" diameter, 10' length; removal .015" per pass at feed rate of 3' per minute.

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Precision **Abrasive Belt Grinders**

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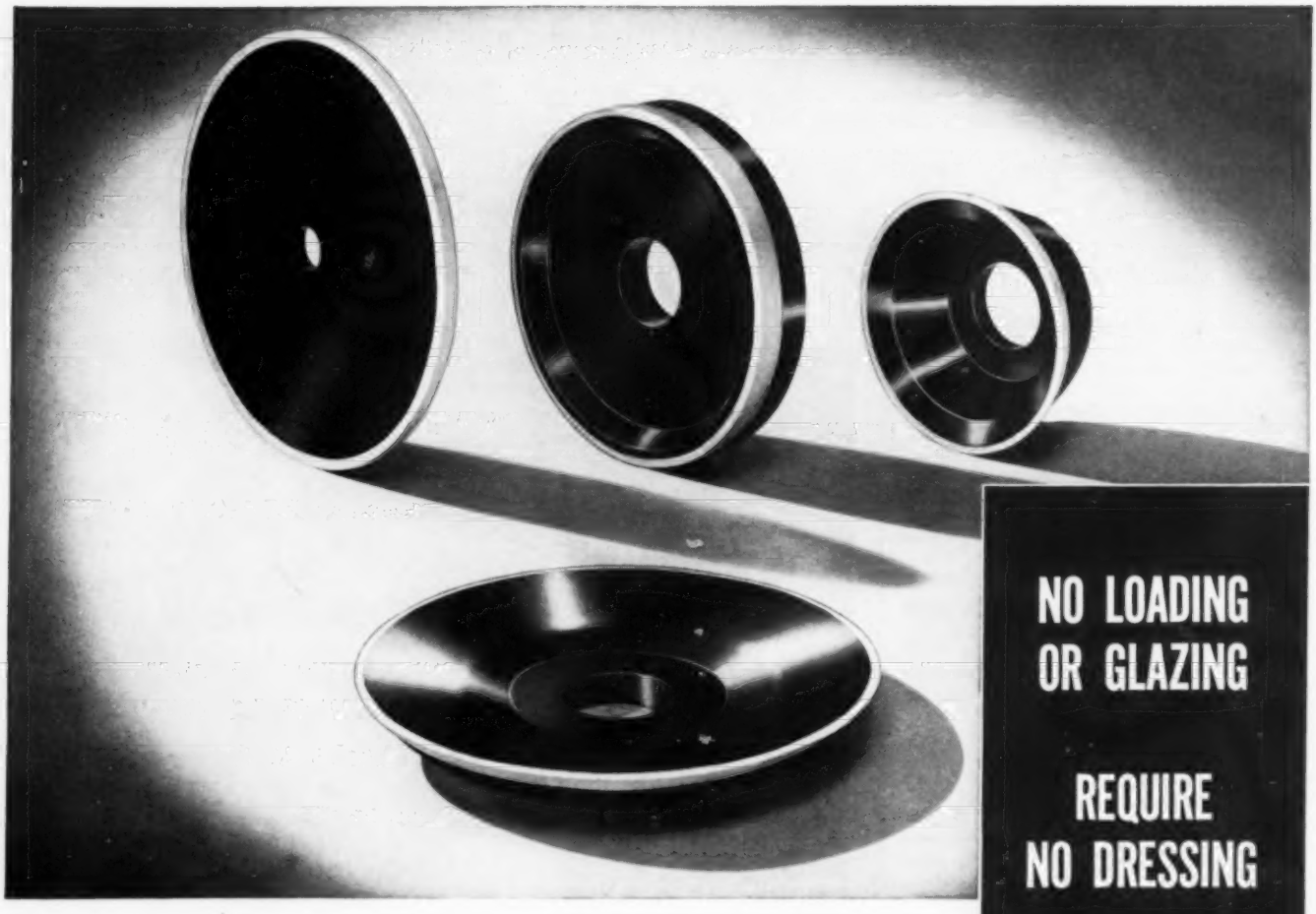

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MANHATTAN DIAMOND WHEELS

CUT FASTER, COOLER . . . LONGER

Every Manhattan Diamond Wheel is specially *bonded* to assure precision grinding at top speed without loading or glazing. Resinoid bonded for tungsten carbide grinding, they cut cool and free with lightest pressure . . . eliminate danger or damage to heat-sensitive carbide. Special metal bonds give you the finish you want for glass, quartz and ceramics. They require no dressing — for either wet or dry grinding.

Manhattan Diamond Wheels give you faster, cooler cutting action *plus* higher wheel efficiency and longer life on the toughest jobs. Specify from Manhattan's wide variety of surface-contact shapes . . . in the diamond concentration and grit size best suited for your surface, cylindrical, or internal grinding operations. You get "More Use per Dollar" with Manhattan Diamond Wheels.

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WRITE TO DIAMOND WHEEL DEPARTMENT

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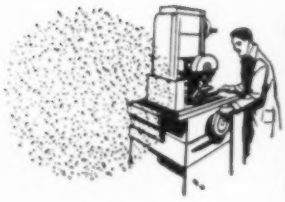
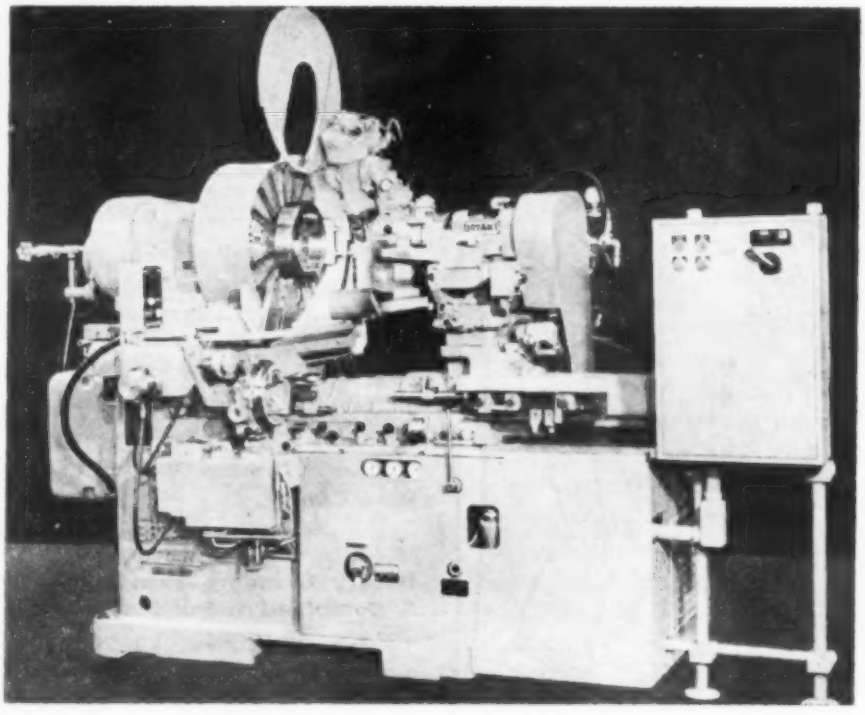


Equipment and Materials



Change-over in Minutes on Internal Grinder

The Bryant 1124-JY Internal Grinder is a versatile machine designed for grinding roller bearing and ball bearing raceways in outer bearing races and straight bores in inner bearing races from 1" to 20" in diameter. Change-over from one job to another is a matter of minutes. Work parts are held in a shoe type centerless fixture which incorporates a rotory electromagnetic chuck having a 21" magnetic driver with 18 adjustable pads.

The model shown here is equipped with a special wheel face dresser which trues wheel width for simultaneous plunge grinding of both inner faces and bore in roller bearing outer races. A radial diamond holder forms wheels used for raceway grinding.

Bryant Chucking Grinder Company, Springfield, Vermont.

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Soluble Oil Has Greater Stability for Soft Alloys

New premium quality soluble oil, formulated specifically to provide maximum stability in cutting of soft alloys has been developed. Called AL-HD, this high-lubricity oil is said to have demonstrated material savings through longer tool life, less down time and fewer sharpenings and dressings. This oil provides excellent in-process rust inhibition along with rapid separation of fines and chips. Non-clogging, AL-HD drains quickly, leaving no film deposit on parts or machines. It is r on-foaming, non-smoking and develops no rancidity or offensive odor even after long use.

Shear-Speed Chemical Products, Detroit, Mich.

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Armour Obtains Patent On Coated Abrasive Products

A patent has been issued to Armour and Co. for its No Load coated abrasive products. The following A weight finishing paper products are available: silicon carbide paper in grits of 500 through 80; heat-treated Garnet paper in grits 280 through 180. Cabinet paper No-load products are manufactured in silicon carbide "C" weight, grits 180, 150, 120, and 100, and aluminum oxide "D" weight, grits 80 and 60.

These finishing and cabinet paper products may be obtained in the following forms: sheets—full size 9" x 11" and cut-sizes; disc-sizes which can be cut from the 9" x 11" sheet.

Coated Abrasives Division, Armour Alliance Industries, Alliance, Ohio.

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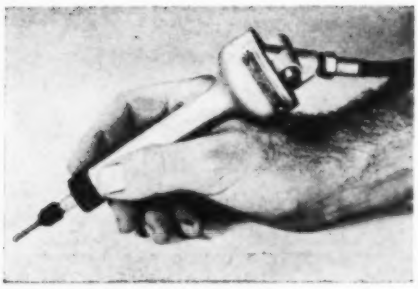
For more information on the equipment and material described in this section, use the Reader Service cards on Page 57. Circle the number on the card which corresponds to the number following the write-up you are interested in.

70,000 RPM Turbine Grinder



New low cost, 12½ oz., light duty turbine grinder made by Desoutter Brothers Ltd. uses a "balanced design" body for comfortable handling. Complete with chuck spanner, head spanner, 10′ of 3/8" hose with two connectors, jet plates and dressing stone grinder runs cool, blowing chips away from work and features automatic air shut off when it is disconnected. It is specially designed for tool and die makers requiring intricate work.

Newage Industries, Jenkintown, Penn.

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Diamond Coated Tools

Obtainable in any practical size and configuration, Ordco routing and beveling tools can provide fast, precision shaping of such materials as refrasil,

astralite, epoxy-glass, glass phenolic, polyester laminates, melamine, and all glass-reinforced plastics. Tools are offered in standard and special shapes with angles or radius to fit any required dimension. Standard tolerance is +.010.

O'Rourke Diamond Co., North Hollywood, Calif.

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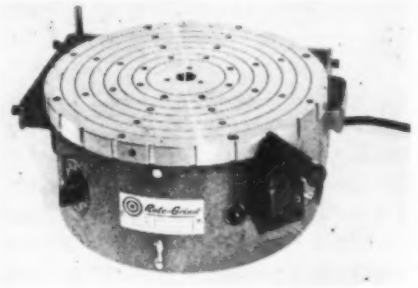
Rotary Grinding Table & Combined Index Fixture

Model 710-V Index especially designed to provide a power rotary table for surface grinder, and also used as an index table, is hand operated to give a combination index 2,



3, 4, 6, 8, 12, and 24 for jig grinder holes, drilling, or grinding equally spaced holes. Parts can be quickly drilled without fixturing or drill jigs.

The table is powered by electric motor with variable speed control.

New COOLTEX gives smoother finishes

Everybody—from machinist to customer—is crazy about the new, smoother finish that Cooltex makes possible. Your local Texaco Lubrication Engineer can show you why—and tell you about the other advantages you get when you use this new chemical coolant. Call him today! Texaco Inc., 135 East 42nd Street, New York 17, N. Y.

TEXACO

Throughout the United States

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Forward-reverse switch clutch is provided for hand operation and indexing.

Unit is designed especially for laboratory development or production. Special models are made for use on ultrasonic and disintegrating machines. These tables can be submerged.

M & M Tool & Manufacturing Co., 1124 E. Third St., Dayton 2, Ohio.

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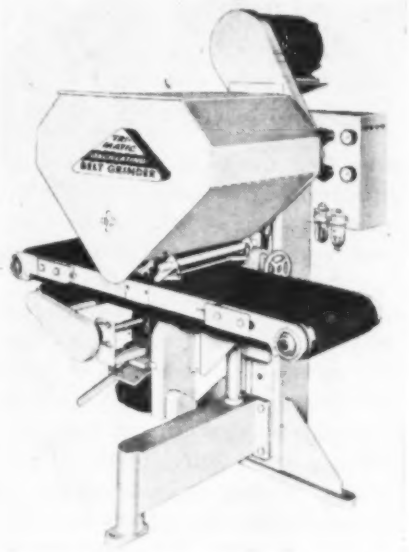
Oscillating Belt Grinder

Deburring, descaling, grinding, and polishing can all be accomplished on the new Tri-Matic oscillating belt grinder. The controlled oscillating movement of the abrasive belt through positive steering without stretching is



said to offer faster cutting, less loading, and longer belt life through the shearing action of the abrasive belt. Belt tracking is completely eliminated on any belt width from 6" to 12".

Belt oscillation is maintained and controlled by air-jet sensing which activates electronic controls and imparts a continuous oscillating belt action with variable and adjustable lateral travel and lateral travel speed.

The conveyor is driven by a ½ hp motor independently of the work-belt at variable speeds ranging from 60" to 120" per minute. The work-belt is driven by a 5 hp motor at 5000 sfm.

Sales Service Mfg. Co., 2363 University Ave., St. Paul 14, Minn.

Use postpaid card. Circle No. 33

Deep Hole Bore & Groove Gage Speeds Accurate Measurement

A new type direct reading deep bore gage quickly determines the diameter

POSITIVE FILTRATION

(TO 1/2 MICRON) FOR AS LITTLE AS

.00015¢ PER GALLON!

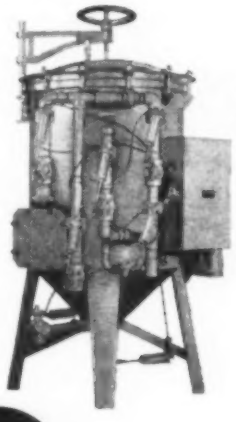
AND IT'S COMPLETELY AUTOMATIC!

Now, from Olson, a new dimension in industrial filtration — the first completely automatic, pressure-type filter! Every cycle — precoat, run, backwash—is automatically controlled. Injection of filter-aid (when used) and sludge carry-out are also automatic.

Maintenance is virtually eliminated in this trouble-free system. No parts to change, no elements to replace, and most important, *no costly downtime for cleaning!*

In large central systems, or with individual machines, Olson Filters guarantee over 96% purification of all types of coolants, cutting oils, quenching oils, cleaning and washing solutions and other industrial solvents at the lowest cost per gallon.

By the way, what are *your* costs per gallon? Why not check and see? Then call Olson.



The new Olson Industrial Filter is available in 8 standard models, from 10 gpm to 600 gpm capacities.

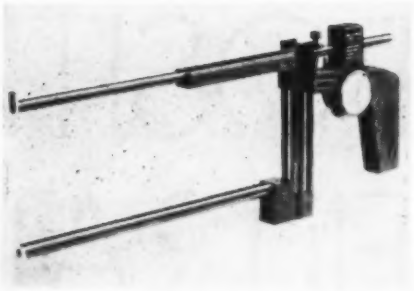
Write for free catalog on the new Olson automatic pressure-type filter.

OLSON FILTRATION ENGINEERS
Division of The American Laundry Machinery Company
DEPT G, CINCINNATI 12, OHIO

Use postpaid card. Circle No. 232

of grooves, bores, counterbores, recesses, and hard-to-reach bores. It is designed to simplify precision inspection of O-ring, Truarc snap ring, and many types of grooves and bores normally difficult to measure accurately.

Three sizes are offered covering holes between 1⅝" to 10" diameters and up to 10" deep. Interchangeable tips permit three-point inside diameter measurements, as well as two-point outside diameter measurements.

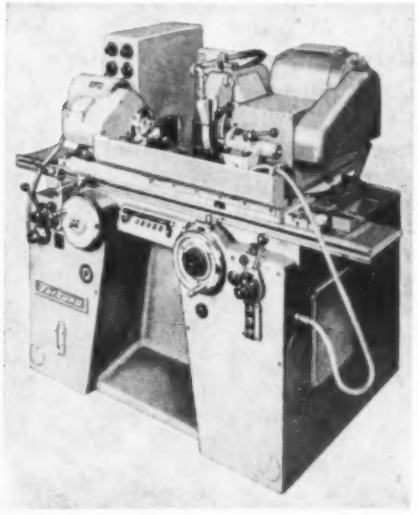


Mueller Gage Co., Div. of Mueller Laboratory, 1052-1058 N. Allen Ave., Pasadena, Calif.

Use postpaid card. Circle No. 34

Cylindrical Grinders for Precision Production

The new Fortuna AFB series cylindrical Grinding Machines, from a plain manually fed grinder to fully automatic cycle control models, may be used for traverse and plunge-cut grinding. Easily adapted to internal grinding of single or mass produced workpieces, they feature a hydraulic table traverse with infinite speed variation between 2" and 26 feet per minute; two speed table traverse hand wheel, easily adjusted table dwell and smooth accurate table reversal to within .0004". The workpiece holder table swivels for taper grinding and has a dial gage and stop for angular settings.



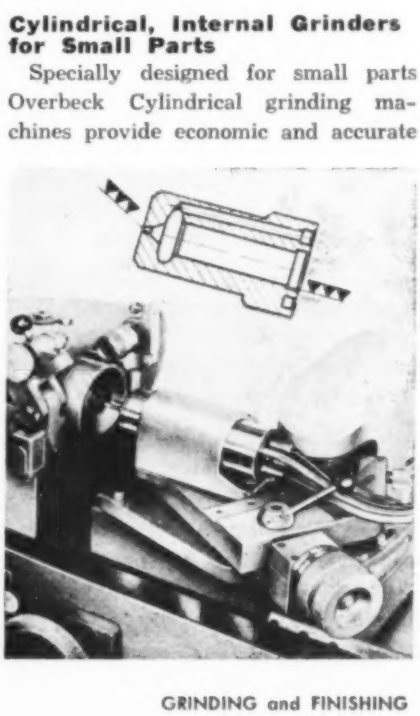
The automatic models control rough and finish grinding through the "Finitor," an automatic sizing device which controls the in-feed of the work table by continuous measuring of the workpiece. Special features of the grinder permits grinding of multi-diameters, fillets, face, and tapers in one operation.

Cosa Corp., 405 Lexington Ave., N. Y., N. Y.

Use postpaid card. Circle No. 35

Cylindrical, Internal Grinders for Small Parts

Specially designed for small parts Overbeck Cylindrical grinding machines provide economic and accurate



Which backing would you specify ...and why?

In the above picture, the backing on the abrasive belt at right is Jeans, a lightweight, flexible cloth used chiefly in woodworking applications. The Drills cloth backing on the left is a heavy, extremely durable cloth used for all types of metal grinding operations. They are but two of many different types and weights of cloth, paper, fibre, and combination backing materials. Choosing the *right* one for your particular application can make a big difference in your product finishing costs. Which is why more and more manufacturers turn to the expert recommendations of Jewel Brand Abrasives Engineers. If the right choice is up to you, call on them for the backing you need. Write for details. Abrasive Products, Inc., 517 Pearl Street, South Braintree, Mass.

belts
rolls
sheets
discs
specialties

JEWEL BRAND

COATED ABRASIVES

ABRASIVE PRODUCTS, INC., South Braintree 517, Massachusetts

Use postpaid card. Circle No. 233

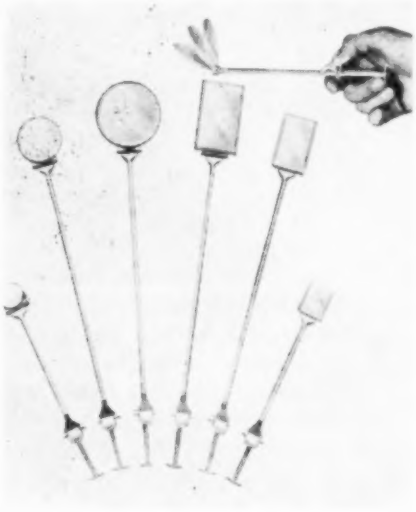
interior and exterior grinding. Moving on hardened guide ways and spindle bearings elements of these machines slide fast even when clamped tightly.

Aaron Machinery Co., Inc., New York, New York.

Use postpaid card. Circle No. 36

Thumb-Action Ratchet Inspection Mirrors

Built for easy, one-hand operation, a series of six thumb-action ratchet mirrors are designed to be inserted



past any obstruction. Pushing the plunger handle and locking the mirror to any angle between 90° and 180° adjusts to a convenient viewing angle. The mirrors are replaceable.

Ullman Devices Corp., Ridgefield, Conn.

Use postpaid card. Circle No. 37

Plastic Film Boot Protects Reciprocating Rods

The P-F plastic film dust boot protects reciprocating rods, such as those of air and hydraulic cylinders. It is made of plastic film, electronically sealed.

Oil leakage is easily trapped. Hermetic sealing against corrosive liquids is provided. Available in various shapes, sizes, and colors.

A. F. Gagne, Associates, 50 Wall St., Binghamton, N.Y.

Use postpaid card. Circle No. 38

NEW KIRK & BLUM

Dust & Fume Control CATALOG

52 pages showing 60 different installations in major industries

See how Kirk & Blum engineers the best suited dust and fume control system for each particular application.

See how Kirk & Blum provides one source for the complete operating system—design, fabrication, installation—*one* undivided responsibility.

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THE KIRK & BLUM MANUFACTURING CO. 3124 Forrer St., Cincinnati 9, Ohio

Please send me Dust & Fume Control Catalog.

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Firm_____

Address_____

City_____ Zone____ State_____

Use postpaid card. Circle No. 234

Versatile Wet Blasting Abrasive

Effect of abrasive selection on the application of wet blasting is underlined by the versatile performance of Liquasheen, a manufactured abrasive. Consisting primarily of glass beads, made uniformly round, the abrasive gets its name from the sheen it imparts to work cleaned and finished. Combined with the abrasive's resistance to fingerprinting on non-ferrous parts, its resistance to water staining in drying of parts and its characteristic not to "flower" or "highlight," the sheen imparted frequently provides the desired finish on end products. Highly resistant to fracturing, Liquasheen abrasive has an average life of 40 to 50 hours of actual blasting time.

Techline Division, Wheelabrator Corp., 1169 Avenue V, Vicksburg, Mich.

Use postpaid card. Circle No. 39

Automatic Drill Pointer

Precision drill point grinder for pointing drills from .032" to 1.50" diameters holds drill points concentric within .0002". Model 100 Winslo-Matic Drill Pointer produces automatically helical (self-centering) points as well as conventional points. Four different power-operated work-heads are available and are quickly changed to accommodate the range of various drill diameters. Forms are generated by means of a combination of 2 cam movements.

Production rate is variable for sizes and types of drill materials. Small drills

can be pointed in 3 seconds. Pacesetter adjustment sets interval between cycles. Wheel dresser is fully automatic and self-compensating. Quality of drills pointed between wheel dressings is provided by a selector switch. Indexing is controlled at the point of the drill, therefore, no adjustment is required for variations in drill length. Machine is approximately 36" x 48" x 54½" high.

Winslow Product Engineering Corp., Arcadia, California.

Use postpaid card. Circle No. 40

Adjustable Aluminum Weights Aid In Wheel Balancing

A set of three infinitely adjustable aluminum weights (replacing the traditional four solid brass weights) has been developed which makes possible the precision balancing of a grinding wheel in minutes after the wheel is in balance position. These weights may be used in conjunction with all existing types of balancers.

Aero Supply Mfg. Co., Inc., Corry, Pa.

Use postpaid card. Circle No. 41

Salvage, Toolroom, Production Honing Machine

New honing machine is designed for production runs, toolroom work or salvage operations, price within the reach of shops heretofore deprived of auto-

Immediately Available!
to Save You Time
Broaden Your Abrasive Opportunities
Improve Your Product Quality

The Only Complete, Comprehensive STOCK LINE of MULTI-USE, SOFT RUBBER BONDED ABRASIVES!

Discover the many new applications modern Brightboy offers you to replace older, costlier metalworking methods! The specially-compounded abrasive and rubber in versatile Brightboy work simultaneously to produce

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frequently in one operation

STOCK NUMBERS JOB-MATCHED TO YOUR REQUIREMENTS

Wheels • Sticks • Rods • Blocks
for machine and manual operations

largely eliminate the necessity for special compounds or special operations setups. Silicon Carbide and Aluminum Oxide grains, grades extra fine to extra coarse, in soft, firm and tough rubber binders.

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BRIGHTBOY INDUSTRIAL DIVISION
WELDON ROBERTS RUBBER CO.
95 North 13th Street • Newark 7, N.J.

America's Pioneer Manufacturer of Rubber-Bonded Abrasives

Use postpaid card. Circle No. 235

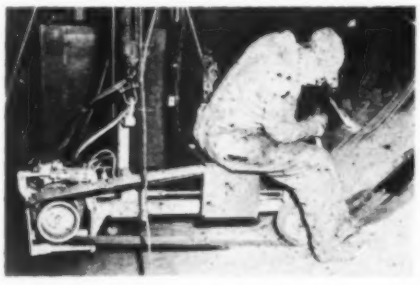
matic honing is reported by Superior Hone Corp. Model "J2" provides variable spindle speeds from 225-525 RPM and is powered by a ½ HP, 110-V, 60 cycle, single phase motor. Drive, motor and coolant tank are enclosed in the heavy steel base. Also featured are a tray top, sealed ball bearing spindle, splash guards and anti-splash screen in the coolant tray. Fourteen gallon coolant tank is removable for easy cleaning.

Superior Hone Corp., 1637 Elreno Street, Elkhart, Indiana.

Use postpaid card. Circle No. 42

Heavy Duty Belt Grinder Grinds Welds Inside Tanks

A standard G & P heavy duty belt grinder, as shown in the illustration, is adapted for grinding heavy welds inside tanks of 16' to 20' diameters. Mounting a saddle on this unit, the operator rides inside the rotating tank.



Powered by a 7½ hp motor, and using abrasive belts 4" x 132", the grinder removes excess weld quickly and economically.

Grinding & Polishing Machinery Corp., 2530 Winthrop Ave., Indianapolis 5, Ind.

Use postpaid card. Circle No. 43

Goblet Finishing Buff Offers Toughness With Gentle Action

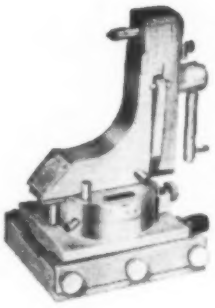
Goblet metal finishing buff, made of springy, dense wool fibers, offers toughness and endurance with gentle surfacing action. Construction of fibers allows buff to withstand effects of frictional heat.

This Ray Buf style 154 uses liquid or solid polishing compounds.

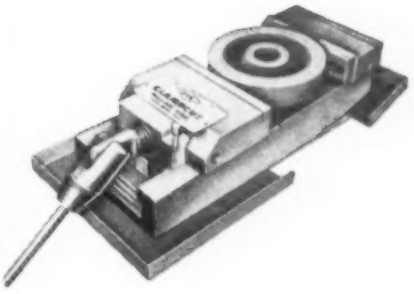
Schlegel Manufacturing Co., Dept. G-B, 1555 Jefferson Rd., Rochester 23, N.Y.

Use postpaid card. Circle No. 44

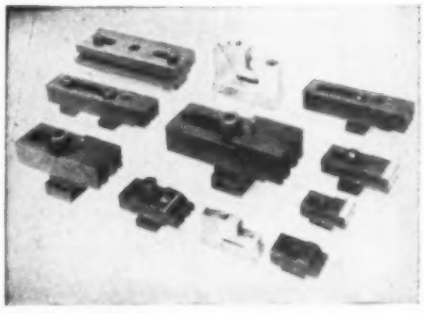
J&S DOWN-HOLDING DEVICES and WHEEL DRESSERS LEAD THE FIELD



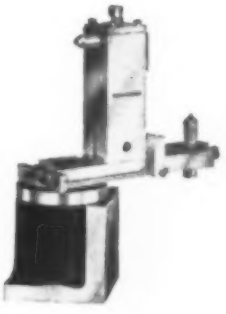
Fluidmotion Wheel Dressers—Dress two angles tangent to a radius, using ONE handle in one continuous motion. Operation is so fast and simple that beginners can use them. For all types cylindrical and surface grinders.



J & S Swivel Vise—The only hardened and ground swivel vise that mounts low, swivels, needs no pedestal. Patented down-holding clamping jaws give many times the holding power of an ordinary vise, yet only half the weight.



J & S All-Purpose Jaw Clamps — For any machine table or face plate. Five models—one adjusting screw has a holding force of 2½ tons on Small model, 12 tons on Jumbo model. Eliminate u-clamps, straps and fingers. No obstruction problems, no interference with measuring tool readings.



J & S Form-Master—Sturdy wheel dresser for shops with less frequent wheel dresser requirements. High quality, 100% dust-proof, it is capable of dressing any radii up to 12" convex, up to 15" concave.

Write for free literature and further information.

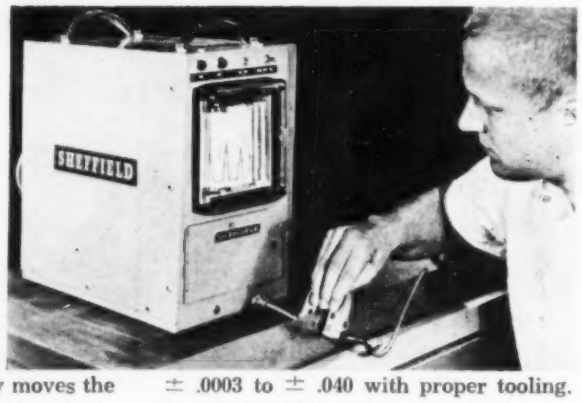
J & S TOOL CO., INC. | CLAMPCUT

850 DORSA STREET
LIVINGSTON, NEW JERSEY

Use postpaid card. Circle No. 236

Gage Checks Thickness, Draws Profile of Sheet Stock

The pneumatic gage recorder for laboratory and production inspection charts thickness deviation of sheet stock simultaneously with gaging. The manufacturer states this solves the problem of miking the sheet with a mechanical gage and then writing down each size reading. The operator simply moves the size-sensing element along the sheet, or the sheet can be moved through the gage head, and size deviation is automatically charted on a 4" wide strip chart. Chart travel is operator selected at the flick of a switch.



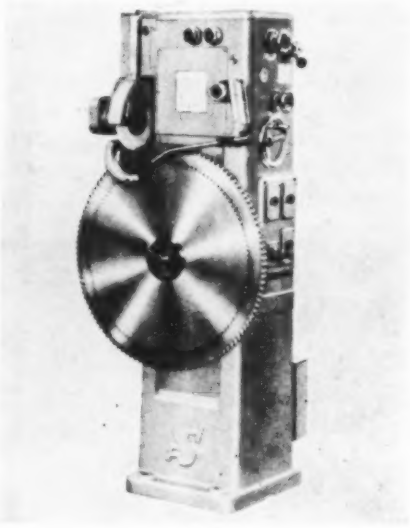
Tolerance range reported is from ± .0003 to ± .040 with proper tooling. Interchangeable tooling permits the instruments to be used for air gaging internal as well as external dimensions and bores.

The Sheffield Corp., Dayton 1, Ohio.

Use postpaid card. Circle No. 45

49" Capacity Saw Grinding Machine

The Tempo Automatic Saw Blade Grinding Machine, model AS-12 for grinding segmental and carbide tipped circular saws has an increased capacity of up to 49" circular saw diameter. The machine is capable of indexing exactly on the same tooth to be ground.



Independent motors for drive and grinding spindle with eight index speeds are available. The grinder is equipped with a shift to grind either straight or curved tooth profiles and may be arranged for grinding automatically Hi-Low Triple Chip Teeth adjustable by a turning knob with a micrometer scale, reading .0001" as well as for chamfering each second tooth.

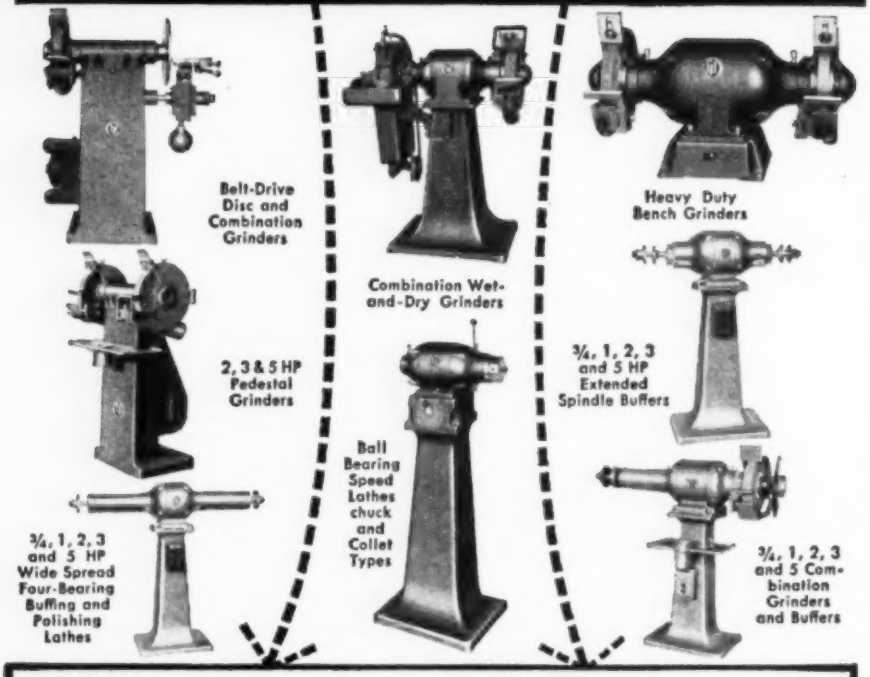
W. Von Arnauld Co., 95 Grove St., Oakland, N.J.

Use postpaid card. Circle No. 46

Portable Grinder for Railroad Rails

First portable rail surface grinder utilizing a continuous abrasvie belt is said to cut rail surface grinding to less than half the time required by conventional methods. The new machine contours the head of the rail as the operator holding the handlebar grips moves forward and backward, and adjusts the grinding units from side to side in its carriage assembly. The machine is pushed along track on wheels insulated to avoid all danger of throwing block

Everybody KNOWS the line that KNOWS its P's and Q's


Belt-Drive Disc and Combination Grinders
Heavy Duty Bench Grinders
Combination Wet-and-Dry Grinders
2, 3 & 5 HP Pedestal Grinders
¾, 1, 2, 3 and 5 HP Extended Spindle Buffers
Ball Bearing Speed Lathes chuck and Collet Types
¾, 1, 2, 3 and 5 HP Wide Spread Four-Bearing Buffing and Polishing Lathes
¾, 1, 2, 3 and 5 Combination Grinders and Buffers

PRICE is an attractive feature in the famous CINCINNATI general purpose buffers and grinders, supplied in a variety of capacities and designs since 1902.

QUALITY, however, has never been sacrificed in the production of these buffers and grinders. We sincerely believe the Cincinnati line is America's top dollar value!

Featured Nation-wide by Leading Distributors. Write For Catalogue TODAY!

Makers of a complete line of pedestal and bench grinders and buffers, speed lathes, dust collectors and cut-off machines.

THE CINCINNATI ELECTRICAL TOOL CO.

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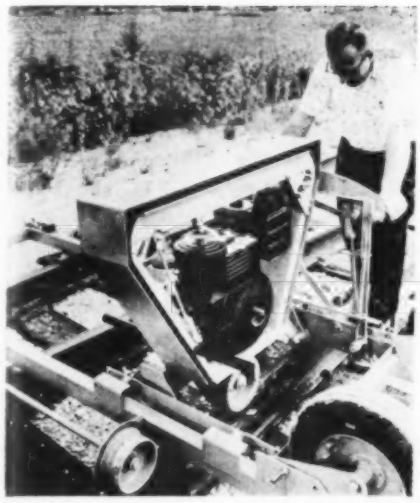


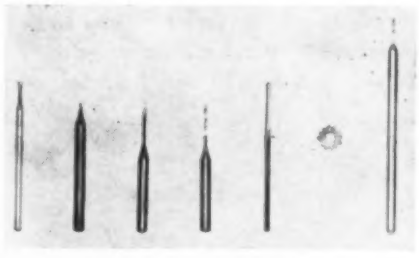
signals. One man can operate and lift the machine from the track. It uses a 106" x 4" wide belt, mounted on rollers in a triangle using an 85 Durometer removable contact wheel which permits the moving belt to shape itself to the contour of the rail head.

National Cylinder Gas Division Chemetron Corp.

Use postpaid card. Circle No. 47

Diamond and Carbide Miniature Grinding Tools

Starbide carbide tools were designed to meet precision miniature tooling problems. Illustrated are a 1/32" end mill, .022" spade drill, .030" twist drill, 1/16" reamer, and .066" thick slitting saw. They have diamond-lapped superfinished cutting edges to minimize chip build-up and produce finer finishes.



Shown at the far right is a Starlite diamond .025" diameter jig and internal grinding tool with Starlite magnicon metal bond. Larger sizes than those shown are available.

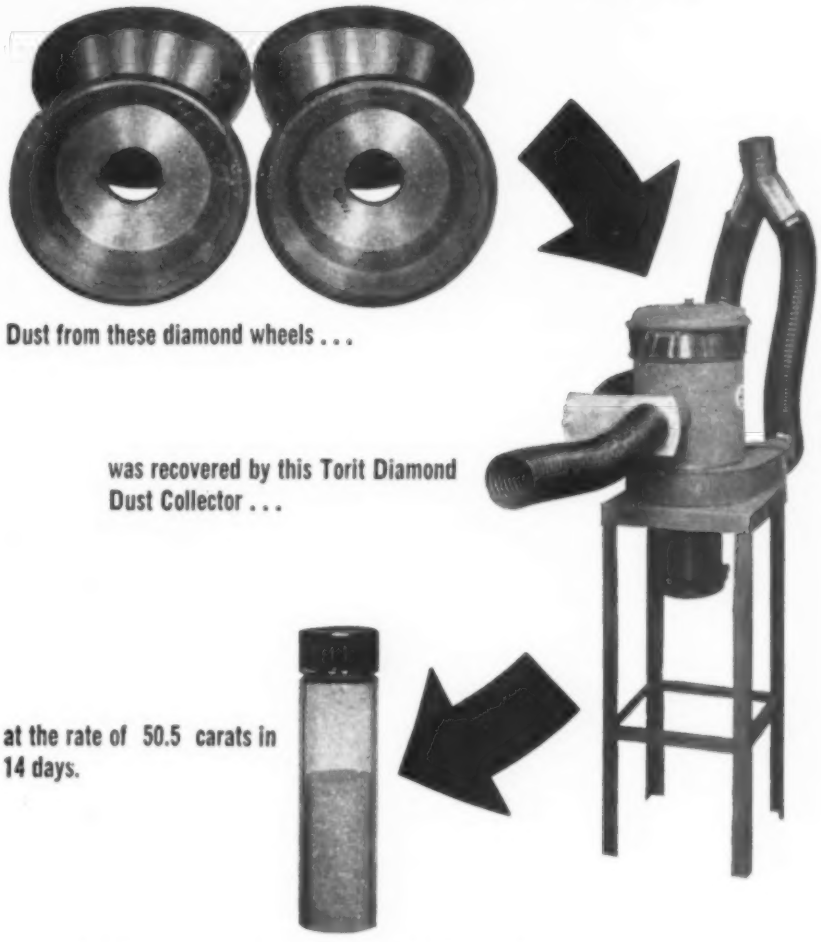
Starlite Industries, Inc., 58th & Market St., Philadelphia, Pa.

Use postpaid card. Circle No. 48

Oscillating Platform for Polishing and Buffing Heads

Polishing and buffing heads which require oscillation may now be mounted on an oscillating platform. Previously this action was obtained by oscillating the spindle itself through bearings

NEW TORIT DIAMOND DUST COLLECTOR SAVES YOU UP TO 30% OF CARAT USAGE; COSTS ONLY $178.50!



Dust from these diamond wheels . . .

was recovered by this Torit Diamond Dust Collector . . .

at the rate of 50.5 carats in 14 days.

exclusive new centrifugal design simplifies recovery, serves all diamond grinding operations

Actually pays for itself in days. In an on-the-job test of this new TORIT equipment, the initial investment was returned in just 21 operating days. The test was conducted by a leading automobile manufacturer under regular operating conditions. Recovery averaged 30% of the carats originally contained in the diamond grinding wheels. You actually get a cash return of $1.00 for every $10.00 invested in diamond grinding wheels.

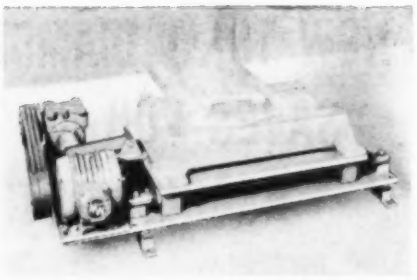
For all diamond grinding operations. This new TORIT Collector provides the same outstanding performance in all types of grinding operations—mist, wick or dry. Its design and operational simplicity also mean virtually maintenance-free service. Its tough construction assures long, long life.

Installs anywhere. TORIT'S new Diamond Dust Collector can be used alone or in conjunction with central exhaust systems or unit dust collectors. It weighs only 65 lbs. and requires only 14" x 22" floor space. Its centrifugal separating action uses no filters or sloppy, inflammable oil baths. Service is quickly and conveniently performed by simply unscrewing the unit's top for removal and emptying of the clear plastic container.

FREE details and full specifications on request. Here's your chance to really save on your diamond usage. Write today for full information on this important new diamond grinding development. Dept. 510

TORIT MANUFACTURING COMPANY 1133 Rankin Street, St. Paul 16, Minnesota

Use postpaid card. Circle No. 238



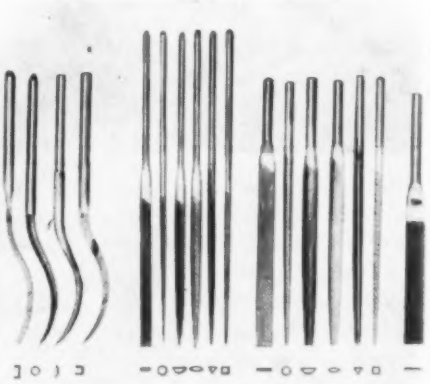
which resulted in extra wear on both the spindles and bearings, and was too expensive to add to existing non-oscillating heads. New platform is sturdily built and mounted on heavy lateral bearing rails which ho'd the head in absolute alignment. Cam-activated arm and drive reducer move the entire head smoothly forward and back. Units are available for heads up to 3000 pounds.

Murray-Way Corp., Birmingham, Michigan.

Use postpaid card. Circle No. 49

Swiss Pattern Steel Files

A complete line of Swiss pattern steel files in 3/32" shank and ⅛" shank, all 4" in length, has been developed. Featured in the line is a new series of single-end rifflers with ⅛" shank, available in flat, round, crossing, and square shapes—cuts No. 00 and No. 1. Straight files are available in six shapes, both shank sizes, No. 00 and No. 1 cuts.



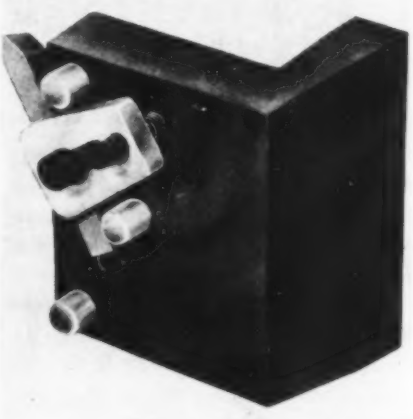
In addition, the Engis line includes a tungsten-carbide flat file and diamond files of many sizes and shapes: straight, rifflers, shoes, and discs.

Hyprez Div., Engis Equipment Co., 431 S. Dearborn St., Chicago 5, Ill.

Use postpaid card. Circle No. 50

Threading Tool Grinding Fixture

Threading tools can be finish ground or resharpened in two minutes by an inexperienced operator on new grinding fixture. 60° and 7° relief angles are incorporated in the fixture which will grind to within 5 minutes tolerance. Size is 2" x 2¾" x 3⅝" and price $19.75.



Cavic Engineering Company, Kirkwood, Missouri.

Use postpaid card. Circle No. 51

UP YOUR PROFITS!

KRAMER solves all your Finishing Problems

Only KRAMER'S TUMBLERS give you SUCCESSFUL FINISHING featuring:

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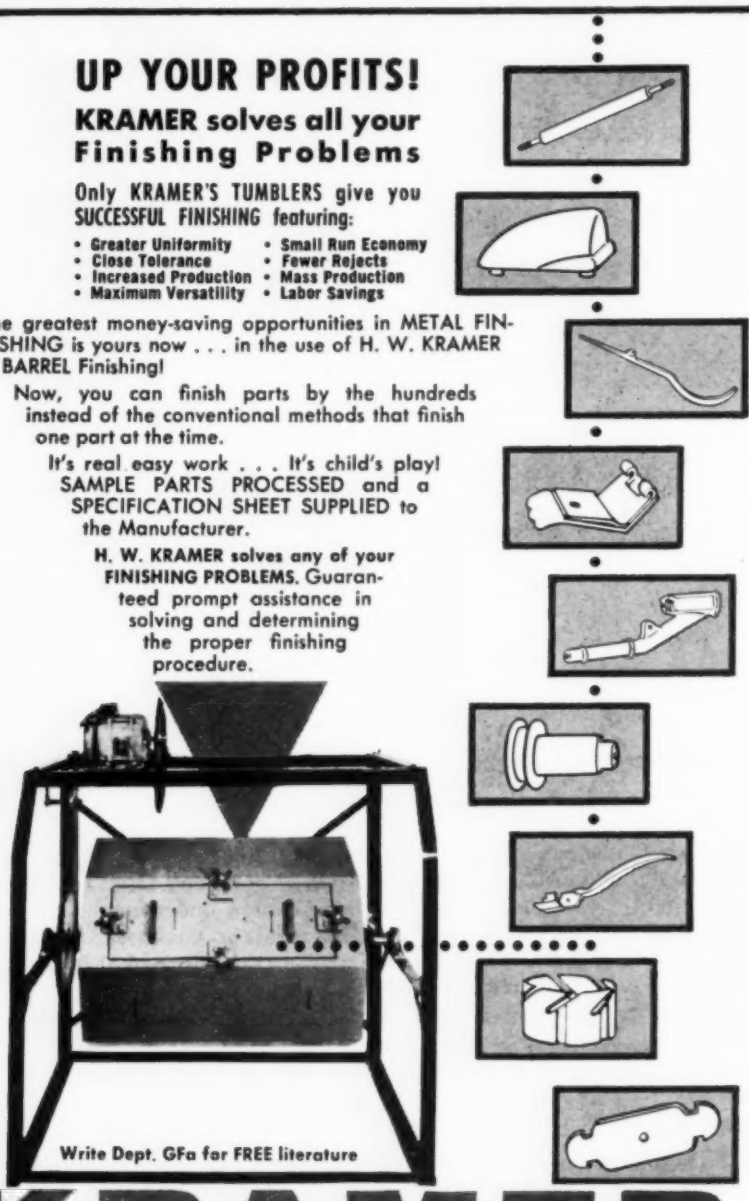
- Close Tolerance
- Increased Production
- Maximum Versatility
- Small Run Economy
- Fewer Rejects
- Mass Production
- Labor Savings

The greatest money-saving opportunities in METAL FINISHING is yours now . . . in the use of H. W. KRAMER BARREL Finishing!

Now, you can finish parts by the hundreds instead of the conventional methods that finish one part at the time.

It's real easy work . . . It's child's play! SAMPLE PARTS PROCESSED and a SPECIFICATION SHEET SUPPLIED to the Manufacturer.

H. W. KRAMER solves any of your FINISHING PROBLEMS. Guaranteed prompt assistance in solving and determining the proper finishing procedure.



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KRAMER FINISHING EQUIPMENT

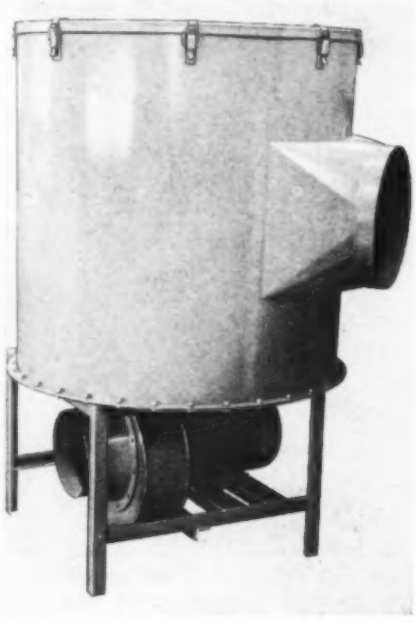
YOUR KEY TO BETTER FINISHING

120-30 Jamaica Avenue, Richmond Hill 18, N.Y.

Use postpaid card. Circle No. 239

Exhaust Shell

New Exhaust shell that fits all standard Mistkops speeds up filter change. Made of heavy gauge steel, top of the shell is equipped with quick



action clamps for fast removal. With the top removed, the old filter can be replaced by a new one in a few minutes.

The Aget Mfg. Co., Adrian, Mich.

Use postpaid card. Circle No. 52

Pistol Grip Design Portable Sand Blaster

Model B "Sandy Jet" Sand Blaster is equipped with a newly designed pistol-grip type blast gun, making it the most powerful and easy to use

unit of its size. All types of abrasives can be used with the three sizes of nozzles. Included with each unit is an operators hood, face shield and two extra nozzles. Price $39.95.

ALC Company, Medina, Ohio.

Use postpaid card. Circle No. 53

Cylindrical Grinder Offers 3" x 12" Cap. Between Centers

Bentley Industrial Corp. introduces the Myford MG12 cylindrical grinder with a capacity of 3" x 12" between centers and a swing of 5". The grinder is said to provide finishes to 3 micro-inches and repetitive accuracy to .0001", and parallelism and roundness held to millionths using the Live Spindle.

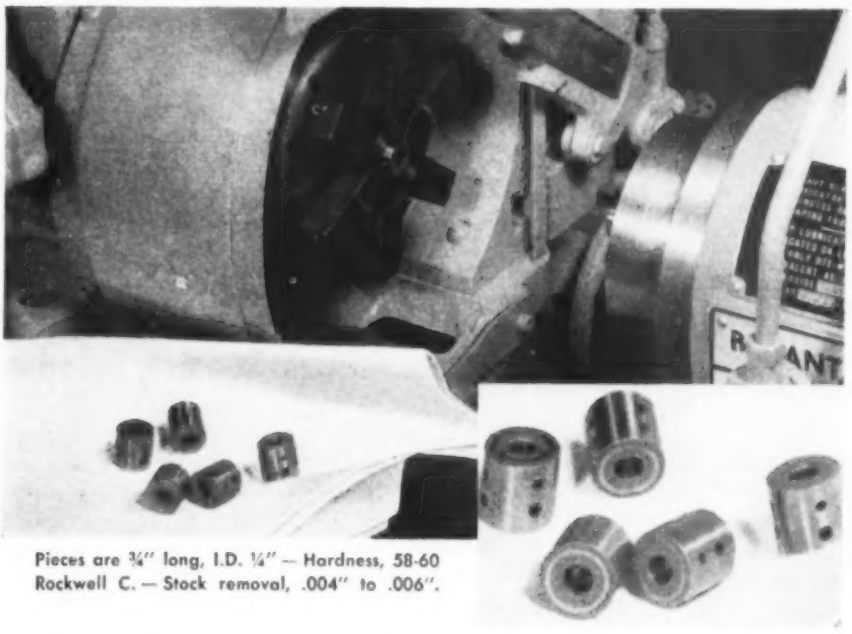
Technical features include a hardened and thread ground feedscrew with forced lubrication and fine feed adjustments reported to dead stop to .000025". A fixed workhead offers great rigidity in holding work on dead or live centers.

Bentley Industrial Corp., New York, New York.

Use postpaid card. Circle No. 54

Face Shield with Head and Chin Protector

Unique safety helmet with a combination acetate face protector and soft vinyl hood and bib is claimed to shield top-of-head, full face and chin while working with flying particles. Head-



Pieces are ¾" long, I.D. ¼" — Hardness, 58-60 Rockwell C. — Stock removal, .004" to .006".

Internal finish of 1 to 2 micro-inches, parallelism and roundness to within ± .000010" . . . produced by Bryant Chucking Grinder Co. with **W & B GRINDING CONCENTRATE 1500**

Bryant tested many coolants, wheels and spindle speeds in readying an internal grinder for exacting work on these parts at Hughes Aircraft Co., Tucson, Ariz. White & Bagley's Grinding Concentrate 1500 did the job best . . . with a Norton 32A80MVBEM Abrasive Wheel, turning at 80,000 RPM. The job was so exacting the W&B 1500 was sent along with the machine.

W&B "1500" will help you too, in jobs as tricky as this or in routine production . . . yet costs as little as 1¢ per gallon of coolant! The foamless, transparent mix keeps wheels open, settles chips fast and provides excellent rust-protection. Send for complete information on amazing W&B "1500".

W-B INDUSTRIAL LUBRICANTS

THE WHITE & BAGLEY CO.

Worcester, Massachusetts · Detroit, Michigan

Originators of Grinding Lubricants

Sulphurized Fatty Bases
Grinding Coolants and Lubricants
Cutting, Grinding and Honing Oils
Forging Compounds

THE WHITE & BAGLEY CO., 88 Foster St., Worcester, Mass.
Please send me complete information on W&B Grinding Concentrate 1500.

NAME ..... TITLE .....

COMPANY ..... STREET .....

CITY ..... STATE .....

☐ Attached letter describes particular problem on which we'd like advice.

Use postpaid card. Circle No. 240

gear is interchangeable and is made of light weight plastic with aluminum spring pivots on each side to give even tension for added comfort. Face protector is made of select optical plastic and is said to be free of any distortion as well as to be fire and spark resistant.

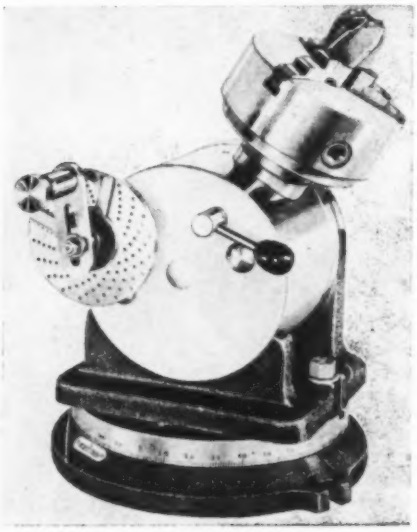
Entire unit weighs less than seven ounces.

Paulson Mfg. Corp., Fallbrook, Calif.

Use postpaid card. Circle No. 55

Swivel Base for Dividing Heads

Newly developed swivel base now available for all models of the complete line of L-W dividing heads make them fully universal. All L-W dividing heads have ball bearing thrust on the worm



shaft and rear end of the spindle and the headstock spindle has a threaded nose. There is a large tapered bearing which is adjustable for end play. The head tilts past 90°.

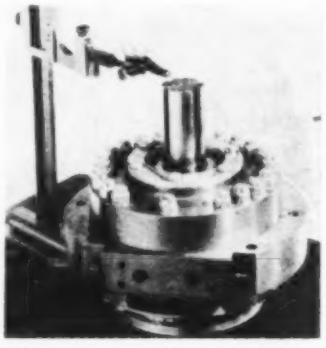
L-W Chuck Co., 80 S. St. Clair Street, Toledo, Ohio.

Use postpaid card. Circle No. 56

Hydraulic Actuators for Critical Ground Applications

A new line of rotary power hydraulic actuators, offering an unusually high torque/inertia ratio, provides power for rotary vibration testing, angular load testing and high-powered angular positioning in flight simulation tables.

Model 30-87-120 is in depth 8" x 8½" wide, has a dry weight of 36 lbs., and

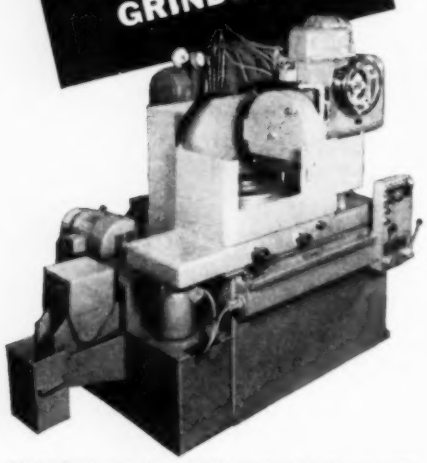


its stall torque at 3000 psi is 8700 in.-lb. The stall torque of Model 30-100-90S is 10,000 in.-lb. at 3000 psi. It is 7¾" x 8⅝" and has a dry weight of 50 lbs. Model 30-190-120, 10⅜" x 10", with a dry weight of 80 lbs., has a stall torque at 3000 psi which is 19,000 in.-lb.

Vard, Inc., 2981 East Colorado St., Pasadena, Calif.

Use postpaid card. Circle No. 57

for TOOLROOM or PRODUCTION GRINDING



Model E rotary surface grinder equipped with magnetic chip separator (optional extra), 12" or 16" Sundstrand concentric pole chuck.

Check the features of the Sundstrand-Arter Rotary Surface Grinder

Two versions of the Sundstrand-Arter Model E rotary surface grinder are available for either production or toolroom installations. Toolroom version can be fed down with manual control at pre-set increments, then switched to automatic repeat in same increments.

Production version rapid-advances to work, wheel head feeds down in pre-set increments automatically until part is to size. First strokes are at rough grinding feed with automatic pre-set change to finish feed. Machine stops automatically, wheel retracts for unloading and loading of new piece.

Features of Sundstrand-Arter Model E

- ✓ Rugged column and long ways permit both heavy stock removal and fine finishes.
- ✓ Tiltable table for either concave or convex grinding.
- ✓ Concentric line-grinding pattern.
- ✓ Rough and fine wheel feeds permit both operations in same machine, reduce handling.
- ✓ Compensation for wheel wear or wheel dressing doesn't disturb feed setup.
- ✓ Sundstrand concentric pole magnetic chuck is standard equipment.
- ✓ Proved on production of clutch plates, discs, saw blades, large bearing cages, slicing blades, etc.

Details available in new Bulletin 308. Write for copy.

SUNDSTRAND ARTER

SUNDSTRAND-ARTER Grinders

SUNDSTRAND MACHINE TOOL DIVISION OF SUNDSTRAND CORPORATION

Belvidere, Illinois, U. S. A.

Use postpaid card. Circle No. 241

Portable Centrifugal Filter

High vacuum, up to 275 inches water, produced in the tank body of the CeCor Model 20T-NS Coolant Sump Cleaner provides filtering of metal chips, fine suspensions and sludge removal from coolant and lubricating oil with one machine designed to service every machine tool in the plant. Filter draws

the entire contents of the sump through the suction hose into the centrifugal filter basket. Liquid is separated from the solids and forced into receiving tank. Filter basket with reusable cloth filter medium has a capacity of 70 pounds for chips and sludge.

Coolant Equipment Corp., Verona, Wisc.

Use postpaid card. Circle No. 58

Automatic, Rotary Screen, Media Classifier

Three grades of media can be re-sized automatically at rates of up to 6,000 pounds per hour in the new Media Classifier. Media can be used again and again by simply re-sizing it in the Almco machine. Sturdy hoist

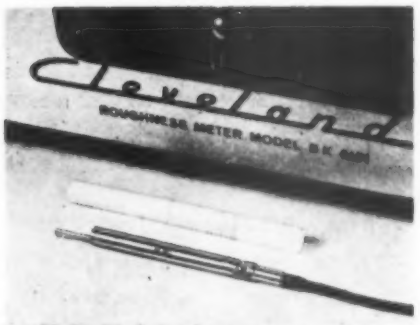
pans under each screen collect sized media. Interchangeable screens are available for classifying a complete range of media sizes. Hopper has adjustable metering chute for controlling flow of media into classifier drum.

Almco-Queen Products Division, King-Seeley Corp., Albert Lea, Minn.

Use postpaid card. Circle No. 59

Surface Roughness Pickup for ⅛" I.D.

New accessory to the Cleveland Roughness Meter, directly interchangeable with the present line of surface roughness pickups, extends the measurement range of internal diameters down to ⅛". It will penetrate a ⅛" diameter hole to a depth of ½" and a ¼" hole to any depth. Pickup may be used on flat surfaces and outside diameters as small as .030". Small size of this pickup makes it ideal for measurement of surface finish in slots, splines, gear teeth, lands, and other



areas of limited size. It will measure to within .025" of a shoulder.

The Cleveland Instrument Co., Cleveland, Ohio.

Use postpaid card. Circle No. 60

ATLANTIC WHEELS

cut work fatigue to a man-saving minimum!

Ask the men who use them — Atlantic Grinding Wheels have a smooth, floating action that requires less grinding pressure, keeps operators fresher for longer periods throughout the daily work schedule. Even where metal removal is roughest, you can count on Atlantic Wheels for fast, cool, clean-cutting performance . . . depend on their rugged resinoid bond for maximum on-the-job safety.

A trial run in your plant will quickly prove their worth in money-saving terms. Have an Atlantic representative recommend the right wheel for your specific requirements. Meanwhile, write for your free copy of the Atlantic Grinding Wheel Catalog. Atlantic Abrasive Corp., 532 Pearl Street, South Braintree, Massachusetts.

Atlantic Abrasive Corp.

A DIVISION OF ABRASIVE PRODUCTS, INC.

South Braintree 85, Massachusetts

STRAIGHT WHEELS • CYLINDER WHEELS • CUP WHEELS
CONES • PLUGS • MOUNTED WHEELS AND POINTS

Use postpaid card. Circle No. 242

Contour Measuring Instrument

For fast economical checking of contour parts up to 30" in diameter and 10" in width, the Model SP-2 Contour-O-Scope can be operated by anyone who can use a micrometer. Piece to be checked is mounted accurately on a precision rotary table and is measured by a universal probe which can handle

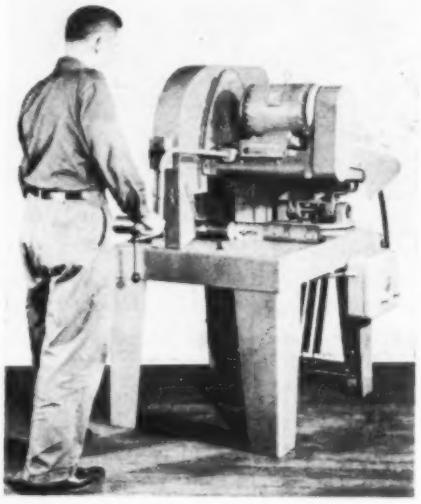
98% of the parts requiring checking. The probe is brought into contact with the surface to be checked by precision ball bearing movements each of which is graduated in .001". Moment of contact is indicated by audio and visual signals. Dimensional accuracy can be checked directly from the print or plotted dimensions without layouts or individual readings by sight and feel.

TurboTronics Corp., Cleveland, Ohio.

Use postpaid card. Circle No. 61

Oscillating Dry Abrasive Cutting Machine

Model 2-A Sever-All large capacity dry-abrasive cutting machine is designed for heavy duty work in metal-working plants, steel mills, etc. This machine has the capacity to cut practically all metals including cold and hot-rolled steel, alloy and carbon steel,



stainless, cast iron, and non-ferrous metals up to 4" solids, round or square; 5½" O.D. pipe or tubing; 6" x 1" flat stock; 6 angle iron; and 8" channels. Work is manually fed with power driven wheel oscillation and cutting pressure applied by the operator through a hand lever.

American Chain & Cable Co., Inc., Bridgeport, Conn.

Use postpaid card. Circle No. 62

Adjustable Parallels

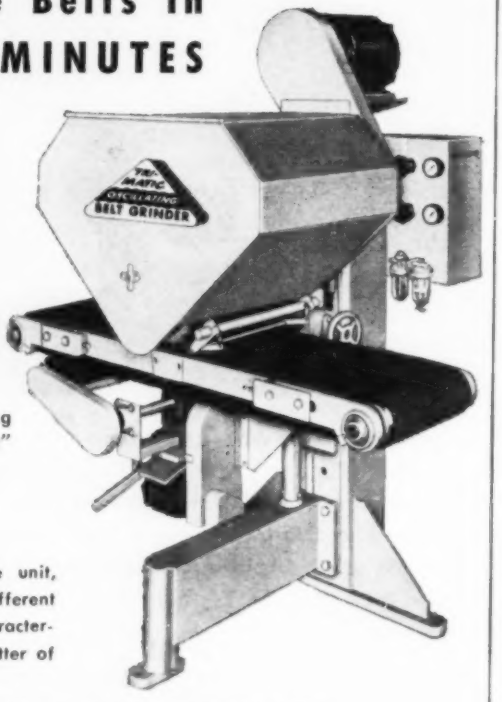
Readily adjustable, Threadwell "Little Champ" Parallels answer bothersome jobs involving many machining operations, assembly and inspection. These parallels can be used as a complementary holding device on drill presses, arbor presses and to support work on surface plates, machine beds, work benches or tables They may be used free or secured and can be mounted with jigs or fixtures designed for specific long run operations.

Threadwell Tap & Die Co., Greenfield, Mass.

Use postpaid card. Circle No. 63

NEW TRI-MATIC Oscillating Belt Grinder

deburrs, descales, grinds, polishes, Change Abrasive Belts in LESS THAN 2 MINUTES



BELT TRACKING adjustments are completely eliminated by the Aer-Tronically Controlled belt oscillation. There are no projecting belt guides to interfere with changing or to fray belt edges. Just slide one belt off and another on. It takes less than 2 minutes from turning off the machine to re-starting.

4 MACHINE SIZES IN 1

A simple adjustment of the air jet sensing unit permits use of 6", 8", 10" or 12" wide belts.

EASY CHANGE CONTACT WHEEL

The contact wheel and mount are one unit, designed for easy changing. Where different jobs require different contact wheel characteristics, the change can be made in a matter of minutes.

Oscillating Belt Speeds Grinding, Prolongs Belt Life

By imparting a shearing action, instead of a straight line push, the abrasive belt cuts faster, cleans itself better, reduces grinding pattern to a minimum and makes belts last longer. Variable speed conveyor adds to versatility.

Write TODAY for illustrated, descriptive Bulletin TM-459.

Send your deburring, descaling, grinding, polishing problems to our abrasive engineers for their suggestions. No obligation.

TRI-MATIC DIVISION

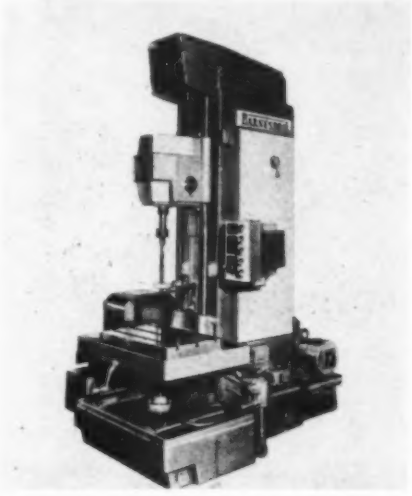
Sales Service Mfg. Co.

2365 University Ave. St. Paul 14U, Minnesota

Use postpaid card. Circle No. 243

Compact, High Production Honer

New honing machine is designed to hone bores ranging from ½" to 6" in diameter with compact design and simplicity of controls. The Model 244 may be equipped with the Barnesdril Plugmatic bore-to-bore sizing unit to maintain size consistency within .0002".



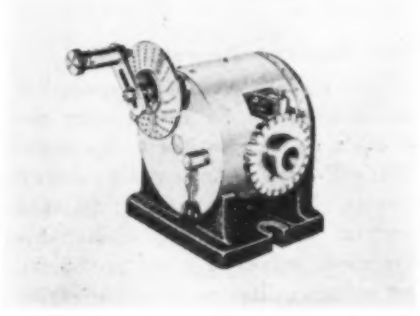
New electric hone expansion unit provides infinite hone feed adjustment without the tubes and rectifiers required in electronic controls. Rapid expansion, rapid collapse and automatic compensation for stone wear are electrically controlled. Machine is available with one or two spindles in a choice of three stroke lengths. Floor dimensions are 40" x 86".

Barnes Drill Co., 886 Chestnut St., Rockford, Ill.

Use postpaid card. Circle No. 64

Direct Indexing Heads

Direct indexing heads are available for all models L-W Chuck dividing heads. Models permit changing from conventional indexing to direct indexing in less than a minute. Worm and



wheel adjustment eliminates back lash. 24-slotted plate is standard equipment with direct indexing models. Machine blanks can also be furnished.

L-W Chuck Co., 80 So. St. Clair Street, Toledo 4, Ohio.

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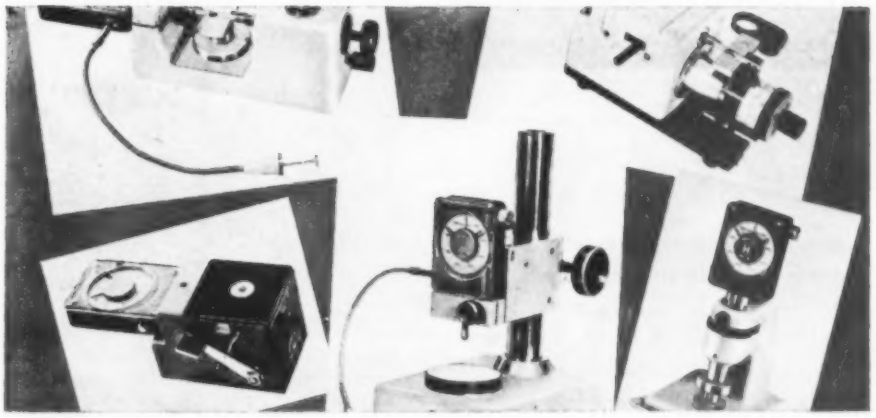


Gages Accurate to Within .00005"

Five new Kwik-Chek gages have been added to the line. Specially designed for miniature work, gages now permit rapid gaging of bores, recesses, grooves and other dimensions to an accuracy of within .00005". The Micro Dial Indicator on each of the new gages is jeweled and features both zero and tolerance-pointer adjustments.

Industrial Division, Hamilton Watch Co., Lancaster, Pa.

Use postpaid card. Circle No. 66

Val Koller tells why he continually adds more Moore Jig Borers and Jig Grinders to his team

This is another in a series featuring the views of owners of leading tool and die companies.

by **VAL KOLLER**
President
Koller Die & Tool Co.,
Milwaukee, Wisconsin
Manufacturer of Dies and Metal Stampings—Tools—Jigs—Fixtures and Gages—Special Machines

Moore equipment in Koller plant, with new #3 Jig Grinder in foreground.

"Since our foundation in 1919 it has been my personal objective to strive for perfection. Since that time perfection has evolved into a .000010" word for tool and die makers. Such precision is rapidly becoming common-place...particularly in electronics and guided missile fields of production. With the installation of Moore equipment in 1950, we have been able to compete successfully in a caliber of work that before was not possible.

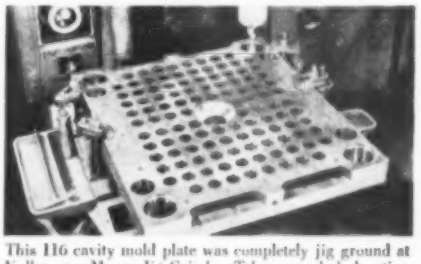
"Since that initial investment in a Moore Jig Grinder we have continually added Moore teammates to our toolroom. Today we operate more Moore equipment than any other top contract shop in the greater Milwaukee area.

"The tolerances and intricate contours now required make Moore Jig Borers and Jig Grinders a must in each toolroom. These machines operate at full capacity each workday with negative downtime due to mechanical failures. In fact, we have found that it costs real dollars and cents to operate *without* Moore equipment.

"This cost factor is just one of many reasons why we recently added another teammate to our toolroom ...the new Moore Model #3 Jig Grinder. This machine, with its tenth-splitting accuracy, hardened ways and wider range, enables us to service more customers better."

Write today for literature describing the unique features of #3 Moore Jig Borers and Jig Grinders or see our catalog in SWEET'S MACHINE TOOL FILE.

MOORE SPECIAL TOOL COMPANY, INC.
725 Union Avenue, Bridgeport, Connecticut



This 116 cavity mold plate was completely jig ground at Koller on a Moore Jig Grinder. Tolerances: hole location ± .0001", hole diameter ± .0001".

HOLES, CONTOURS AND SURFACES, tells how to produce tools and dies the modern way
424 pages,
495 illustrations.
$5 in U.S.A.
$6 elsewhere.

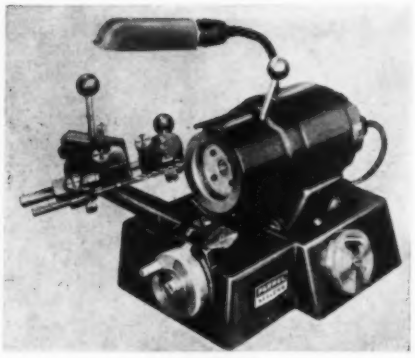
ADD MOORE TOOLS TO YOUR TOOLROOM

JIG BORERS • JIG GRINDERS • PANTOGRAPH WHEEL DRESSERS PRECISION ROTARY TABLES HOLE LOCATION ACCESSORIES

Use postpaid card. Circle No. 244

Bench Type Drill Grinder

Farrel-Sellers 1 G-A Drill Grinder is a self contained bench type unit. It will grind either straight or tapered, right-hand, 2-lip twist drills in sizes from No. 70 to 1" diameter, to any included angle of point from 60 to 150°. New chuck arrangement is easy to load and provides a smooth, accurate method of grinding. It holds the drill so that the axis is in correct relation to the axis of the wheel. This automatically provides proper clearance, increasing correctly from the periphery to the point of the drill. Small drills, which are usually discarded when broken, because it is too tedious and expensive to reclaim them, are easily restored.



Farrel-Birmingham Co., Inc., Rochester, N.Y.

Use postpaid card. Circle No. 67

No Finer Equipment
FOR
MEASURING FLATNESS
EASIER . . . MORE ACCURATELY

LAPMASTER OPTICAL FLATS

So accurate . . . so easy to get flatness readings down to 1/10 of a light band with the Lapmaster line of Optical Flats. Special manufacturing technique and laboratory control assures uniform flats of highest quality.

Available in certified optical accuracies of .000002" or .000001" . . . in either clear fused quartz or Pyrex glass . . . either double or single surfaced . . . in a full range of standard sizes from 1" through 12" dia.

THE LAPMASTER MONOCHROMATIC LIGHT

There's no easier way to inspect and measure surface flatness. The new Lapmaster Monochromatic Light has a powerful helium lamp (40 candle power) for sharp reading . . . light head is adjustable for best reading angle; can be swung completely around to handle tall parts . . . is easily portable in self-contained carrying case.

Write for complete details and measurement chart.

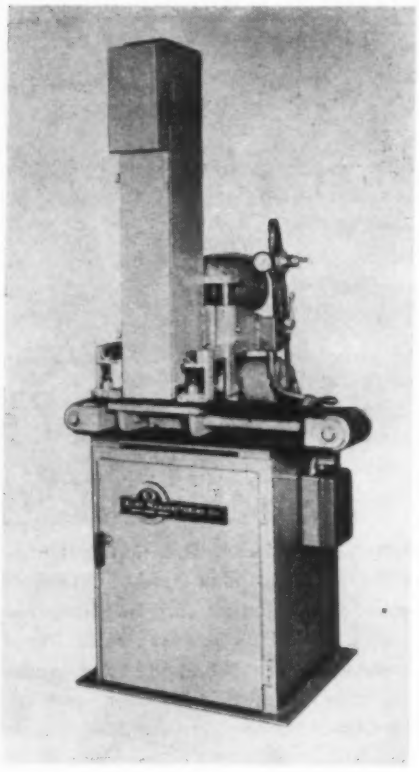
Lapmaster® DIVISION

CRANE PACKING COMPANY
6417 OAKTON STREET
MORTON GROVE, ILLINOIS (*Chicago Suburb*)
In Canada:
Crane Packing Co., Ltd., Hamilton, Ont.

Use postpaid card. Circle No. 245

Abrasive Belt Machine

Low cost Model JC Acme abrasive belt machine for performing flat grinding, deburring and polishing operations is equipped with a 6" wide belt and will handle parts having stock thickness up to 3". It is ideally adapted to finishing operations on flat surfaces of bars, strips, blanks, stampings, forgings, die castings and sand castings. Abrasive belt on the machine is pneumatically tensioned. Features include positive manual or automatic belt tracking, micrometer grind pressure adjustment, V-belt drive for abrasive belt speed changes and infinitely variable control of conveyor belt feed. Floor space is 24" x 30".



Acme Mfg. Co., Detroit, Mich.

Use postpaid card. Circle No. 68

Mist Coolant Dispenser

Improved mist coolant dispenser has been re-designed for easier, more dependable and longer lasting operation. This self-contained, compact coolant system which eliminates old type brush-on and flood type cooling has even more extras to speed production and cut costs. Unit can be easily adapted for double service without buying another dispenser. Any soluble oil or compound may be used in the reservoir.

National Aircraft Corp., 2535 Morris Ave., Union, New Jersey.

Use postpaid card. Circle No. 69

American Society for Abrasives

Long Island Chapter

Speakers for the first fall get-together of the Long Island Chapter were **G. O. Plaff**, manager, abrasive sales, and **D. A. Swardson**, abrasive specialist, of the Abrasive, Division, Wheelabrator Corporation, Mishawaka, Indiana. The subject: "Selecting Blast Cleaning and Peening Abrasives."

The talk covered the proper abrasive for shot blasting, condition of work, quality of finish required, type of equipment used, and efficiency of blasting equipment.

A film, "Steel Shot," preceded the talk, and a question period followed.

The meeting was held on Wednesday, September 9, at Wheatley Hills Tavern, 170 Post Avenue, Westbury, New York.

Officers of the Chapter for the 1959-1960 season are the following:

President .....**Bert J. Kemper** (Grumman Aircraft Eng. Corp.)
Vice President .....**Paul E. Frick** (Lundy Manufacturing Co.)
Recording Sec'y .....**C. Honor** (J. Soehner & Sons)
Corresponding Sec'y. .....**H. Golden** (Kappel & Mazur)
Treasurer .....**J. Urgo** (Di-Tru Diamond Tool Co.)

Executive Committee

One Year:
G. Poznack ..(New York Twist Drill)
M. Goldsen .....(Triangle Steel Products Co.)
J. J. McCarthy ....(Carborundum Co.)

Two Years:
Frank Cinelli .....(Pioneer Tool Crib, Inc.)
Daniel Vlaun ..(Bay State Abrasives)
Wm. McMahon .....(Minnesota Mining & Mfg.)

Officers of the Reading Chapter, ASA, for 1959-60, from left to right, are the following: (seated) Paul A. Miller, Textile Machine Works, president; Leon Stout, Textile Machine Works, treasurer; (standing) Howard Burkhart, Reading Gray Iron Castings, past president; Norman Snader, Carpenter Steel Company, secretary; Joseph Acker, American Chain & Cable Company, vice president.

Pittsburgh Chapter

"Mechanical Grinding for Steel Conditioning" was the subject for discussion at the first meeting, September 17 at the Pittsburgh Athletic Club.

Harlow G. Jones, director of product engineering for Mid-West Abrasive, was the speaker, assisted by **William Woodward**, of Mid-West's Machine Division.

Sixty-four members and guests attended the dinner and discussion.

The scheduled meetings for the remainder of the season are as follows:

November .....Abrasive Cutting
January .....Coated Abrasives
March .....Abrasive Grain
May .....Manufacture of Steel

A Christmas party and a golf day in June round out the program.

Chicago Chapter

Approximately forty members and guests of the Chicago Chapter teed off in the first annual golf outing held September 26 at the Cog Hill Golf and Country Club, Lemont, Illinois.

Jim Marek and **Ken Jeppsen** of Chicago Screw Co., together with **Joe Stiak** of the Waltham Grinding Wheel Co., were in charge of the outing.

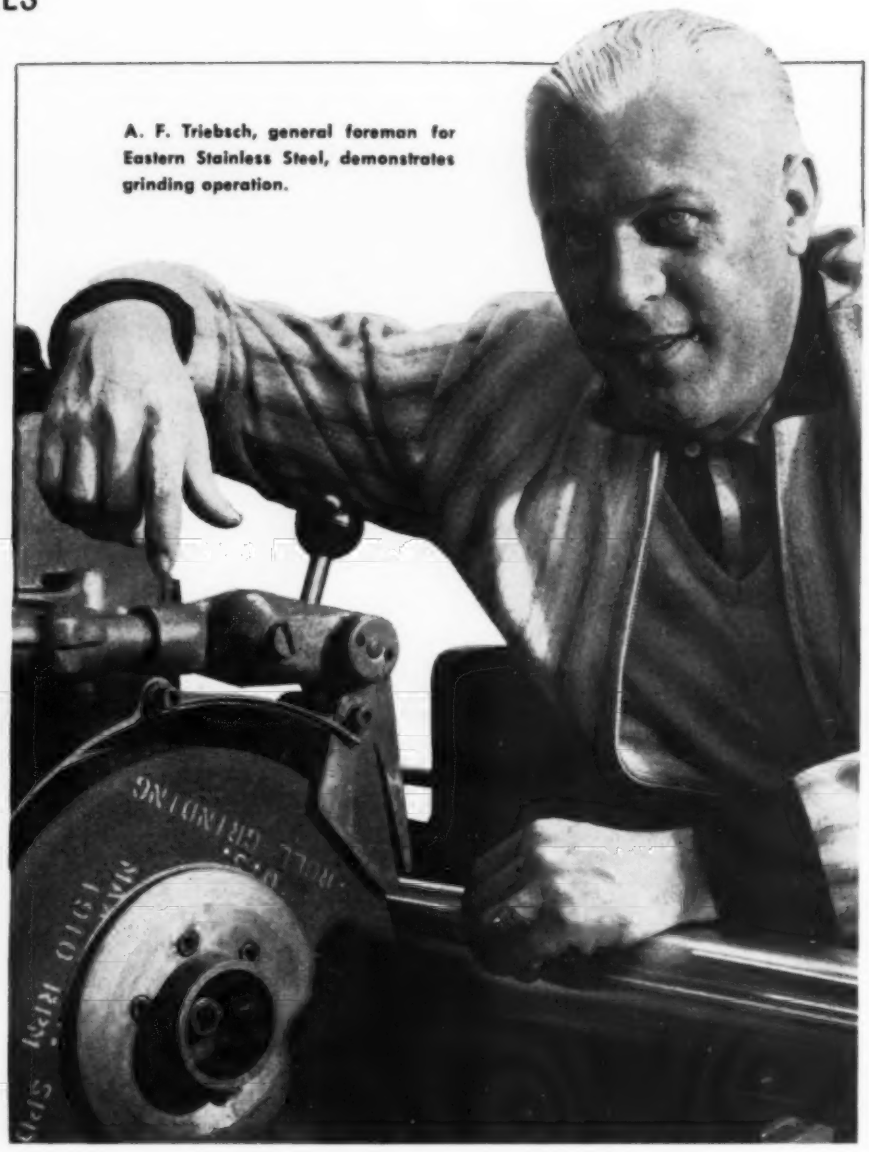
The theme for the regular meetings of the group will be "Fundamentals of Grinding." **Ed Avery**, vice president of Waltham, will be the speaker at the first dinner meeting, on the subject, "The Grinding Wheel."

The group will get together at Nielsen's Restaurant, 7330 West North Ave., on Thursday, October 8.

US RUBBER GRINDING WHEELS

NO CHATTER

Production UP 8%!



A. F. Triebsch, general foreman for Eastern Stainless Steel, demonstrates grinding operation.

"U.S." Grinding Wheels help EASTERN STAINLESS STEEL achieve tolerances of 2/10 of .001" in precision work

In producing stainless steel of great precision, the steel passes through a succession of work rolls under a combined force of 59,000 pounds per square inch. All the rolls must be perfectly round and the tiniest defect must be eliminated. To produce a perfectly flat mirror finish, the rolls have to be 2/10ths of .001" perfect!

This is the kind of work Eastern Stainless Steel Corporation turns out every day. To keep their rolls in perfect balance and symmetry they use "U. S." Grinding Wheels. These amazing wheels allow for no "chatter" or vibration, consequently they never groove the roll. Prior to the use of "U. S." Grinding Wheels, at least an hour a day was lost when the operator had to readjust the machine.

Using "U. S." Wheels, Eastern Stainless Steel found many collateral advantages. Maintenance was reduced by more than 20%. "U. S." Grinding Wheels outlast conventional wheels at a ratio of 4 to 1, an obvious saving of 400%.

You, too, can effect important economies and achieve greater precision by turning your grinding wheel problems over to U. S. Rubber.

US RUBBER

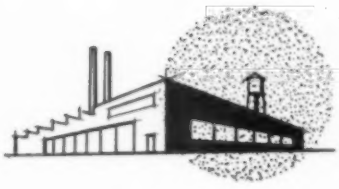
Mechanical Goods Division

United States Rubber

WORLD'S LARGEST MANUFACTURER OF INDUSTRIAL RUBBER PRODUCTS

Rockefeller Center, New York 20, N.Y. In Canada: Dominion Rubber Company, Ltd.

Use postpaid card. Circle No. 246



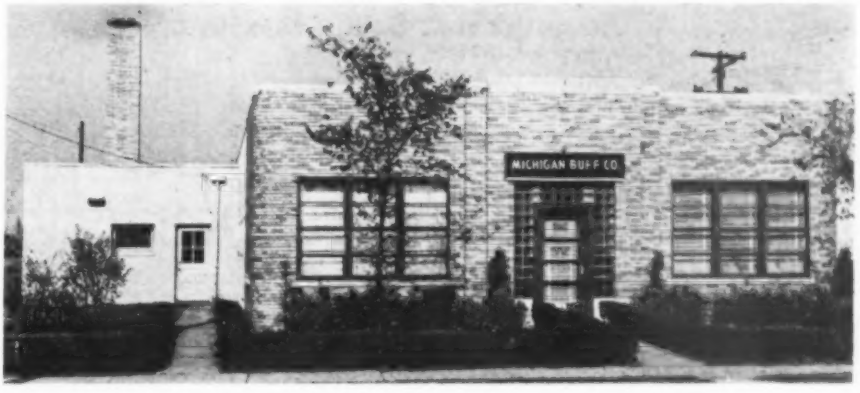
News from the Industry

Michigan Buff Moves Into Modern Plant

Michigan Buff Company, Inc., now in its thirtieth year, has moved into a new and modern plant at 3503 Gaylord Avenue, Detroit 12, according to an announcement by **A. W. Payson**, owner of the firm.

Modern in all respects, the building is air conditioned throughout.

The company handles new and used buffs, polishing wheels and polishing equipment, as well as polishing wheel cement, abrasives of all kinds, buffing compounds, glue and other items pertaining to polishing and buffing. The company is also a jobber and distributor for many large manufacturers.



New plant and office of Michigan Buff Company

Scheiffler Heads Macklin Purchasing Dept.

Robert Franklin, president of the Macklin Company, Jackson, Michigan recently announced the promotion of **E. M. Scheiffler** to the post of Director of Purchases for the Jackson and Canadian plants. Scheiffler has charge of the functioning and operation of the Purchasing Department, and is responsible for the procurement and control of supplies and raw materials. With the company for 24 years in various capacities, he previously served as Purchasing Agent.

E. M. Scheiffler

A. L. Graham

Research Report on ASTE Cutting Fluid Project

"Chip curl" influences cooling action of cutting fluids . . . a fluid can be too good a coolant—these and other facts are discussed in Research Report No. 19, "The Cooling Characteristics of Cutting Fluids," just published by the American Society of Tool Engineers' Research Fund.

The report is an account of the experiments conducted at Massachusetts Institute of Technology by M.I.T. Professors **Milton C. Shaw, Nathan H. Cook**, and **Prescott A. Smith** to determine a reliable method of measuring the cooling characteristic of cutting fluids under actual cutting conditions.

At a cost of 75c each to ASTE members and $1.50 to non-members, a copy is obtainable from Leslie S. Fletcher, ASTE Research Fund Director, 10700 Puritan Ave., Detroit 38, Mich.

Graham Chosen VP of American Forge

A. Lee Graham, plant superintendent of American Forge & Manufacturing Company, McKees Rocks, Pennsylvania, for the past eleven years, has been named vice president in charge of operations.

Stock Machine Program Speeds Delivery, Lowers Costs

Immediate "off-the-shelf" delivery of popular sizes and types of "bare" standard machines is now possible under a stock machine program initiated by The Heald Machine Company.

Field tested for several years, the program has been expanded to include nine models of internal grinders, five rotary surface grinder models, two tool sharpening machines and eight models of Bore-Matics. Included are completed machines ready for final painting and crating, and semi-finished machines that can be completed from stock parts on short notice. Delivery ranges from several days to several weeks, according to **Raymond A. St. John**, vice president and sales manager.

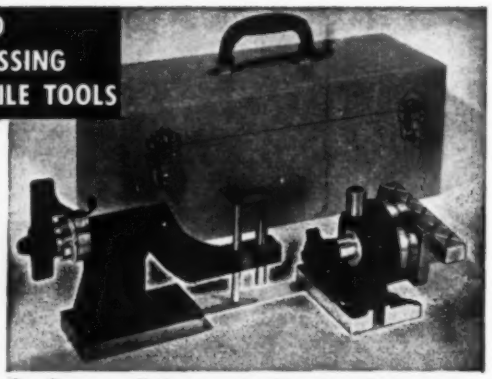
Applicable primarily to simple machining jobs, the machines can be obtained with basic fixtures. Often the tooling and fixtures can be supplied by the customer as economically as by outside sources, saving costs and speeding delivery.

Heald emphasizes that the stock machine is built and tested to the same standards as a special machine. Stock machine sales are said to account for 20% of Heald's sales.

Now ANGLE TANGENT TO RADIUS WHEEL DRESSING WITH NEW VERSATILE TOOLS

MIGHTY GOOD AT ANY PRICE BUT TOPS AT ONLY $149.50
(Both tools including diamonds)

The G-5 RADIUS DRESSER is a precision engineered tool that will dress either a convex or a concave radius from .015" to 1.750" on a 7 inch or 10 inch wheel, and it may be set to the exact radii desired. Graduated stops allow you to dress any desired portion of a radius. The spring tension journal insures chatter free operation. The G-2 ANGLE DRESSER AND TOOL HOLDER is actually two tools in one, having an easy to read vernier scale 0° to 180° giving accuracy within 2" of 1°; an excellent time saver to set up small jobs to be milled, drilled, tapped, etc., on any desired angle.



Our fixtures will dress most radii and angles tangent to each other, similar to those shown below.

FREE handsome, wooden storage box. Write for complete information.

PURCHASE EITHER TOOL SEPARATELY

Now you can purchase either the G-5 Radius Dresser or the G-2 Angle Dresser and Tool Holder separately if you so desire. (Without storage boxes)

G-5 Radius Dresser complete with diamond $80.00.

G-2 Angle Dresser and Tool Holder complete with diamond $87.50.

Replacement diamonds are always available for our units at a reduced price. Diamonds for the G-2 $5.00 each; diamonds for the G-5 $8.00 each.

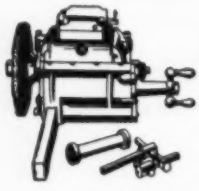
Distributorship available in select territories

ROTHFUSS TOOL COMPANY

BOX 2696, ELMWOOD STATION PROVIDENCE 7, R. I.

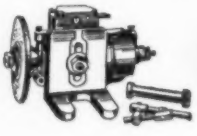
Use postpaid card. Circle No. 247

• for FASTER . . . EASIER . . . MORE ECONOMICAL GRINDING
EASILY MOUNTED FOR ALL SUPPLEMENTARY GRINDING



TOOL POST GRINDER

VERTICAL SPINDLE GRINDER



ANGLE PLATE GRINDER

PRECISION LATHE GRINDER

also special Motorized Spindles

GRINDING ATTACHMENTS

• *for lathes, planers, boring mills, milling machines, shapers, etc.*

For tool rooms and shops handling a wide variety and range of work from the simplest to the most complicated. For internal and external grinding, grinding centers, reamers, taps, dies, rolls, journals, crankshafts, cylindrical, surface or special purpose grinding. With or without horizontal or vertical feeds.

Write for catalogs

"Over 60 Years Service to Industry"

The United States Electrical Tool Co.
3640 LLEWELLYN ST., CINCINNATI 23, OHIO

Use postpaid card. Circle No. 248

NEWS OF INDUSTRY *continued*

Carbo Shifts R & D Management

Three promotions in the Research and Development Division, The Carborundum Co., Niagara Falls, N.Y., have been announced: **Donald G. Sturges**, formerly Manager of the New Products Development Branch, was promoted to Associate Director of the Research and Development Division; **Frederick J. Ross, Jr.**, formerly Manager of the Ceramic Fiber Project, was promoted to Manager of the New Products Development Branch, and **Dr. Wingate A. Lambertson** was promoted from Assistant to the Manager to the position of Assistant Manager of the Engineering Research Branch.

Technical branches are being established in each of the operating divisions to do research and development on their respective established product lines.

Sheffield Corporation Appoints Officers

C. Thorpe Thompson, president of The Cleveland Instrument Company, Cleveland, Ohio, since May, 1956, has been named director, vice president and general manager of The Sheffield Corporation, Dayton, Ohio.

Simultaneously, the appointment of **W. Fay Aller** as staff vice president of engineering and director was made known. Aller has been with the company for over a quarter of a century.

The announcements were made by **Louis Polk**, president of Sheffield and an executive of Bendix Aviation Corporation, of which Sheffield is a subsidiary.

W. F. Aller

C. T. Thompson

Delbert A. Burman has been advanced to assistant director of purchases by the Crucible Steel Company of America. He was formerly a buyer in the company's Purchasing Division.

Appointments . . .

Bay State Sales

Leo P. Fedigan, Jr. and Thomas B. Horton have joined the sales organization of Bay State Abrasive Products Company. Fedigan will be located in the Detroit District and Horton in the Southwest District.

S. Gordon Saunders, manager of the Detroit District, and **John R. Boudreau**, manager of the Southwest District, made the announcements.

L. P. Fedigan

T. B. Horton

Heald Machine Expands in Syracuse, Philadelphia

The Heald Machine Company has opened a new branch in Syracuse, N.Y., set up direct representation in Philadelphia, and added to its Cleveland sales staff, according to a recent announcement by **Raymond A. St. John**, vice president and general sales manager.

Frederick J. Underwood is the new branch manager at Syracuse, assisted by **Richard A. Masters.** The office is located at 2900 Erie Blvd. East, services the upstate New York area. **Ernest I. Nielsen** is service representative.

The Philadelphia office, operating under the New York branch office, is directed by **Albert F. Buckley.** It is located at 57 West Avenue, Wayne, Pa.

Donald B. Sampson has been transferred from Worcester to Cleveland as a sales engineer.

R. H. Stebbins

R. H. Presnall

Gisholt Promotions

R. H. Stebbins, assistant sales manager for Gisholt Machine Company, Madison, Wisconsin, has been named sales manager.

Succeeding him is **R. H. Presnall**, formerly manager of the company's Pittsburgh office. **William Nyberg** has been promoted to Pittsburgh.

William Nyberg

Fisher Abrasive Products

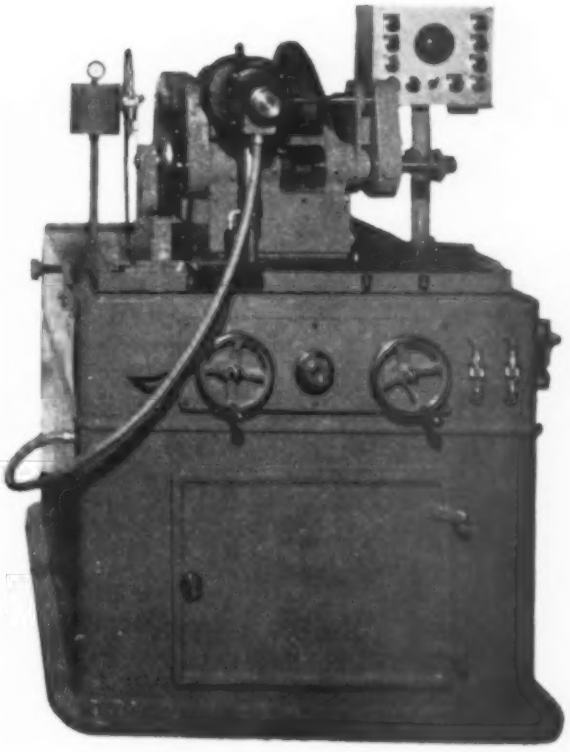
A veteran of more than thirty years in the abrasive field, **D. B. Fisher** is now president of Fisher Abrasive Products Corporation, Brighton, Michigan. The company, organized in 1950 as Mounted Points Company, Inc., was re-named in April of this year. At the same time, the plant was moved to its present location. Fisher was formerly technical director of Frank Bancroft Company, Dearborn, Mich.

D. B. Fisher

NEW!

CARBIDE DISPOSABLE TOOL GRINDER

(Semi-Automatic)



GRINDS ANY SHAPE OR RADIUS.

Holds sides and radius perfect tangent. Will hold .0005 tolerance. Will grind negative or positive angle tools. *One operator can easily operate two machines.* Will regrind your used blanks at a small fraction of their original cost.

Write for further information.

HARVILL-JOHNSON CORP.

618 East Ten-Mile Road

Hazel Park, Mich. Ph. Jordan 4-6110

Use postpaid card. Circle No. 249

To remind you of

CLOVER COMPOUNDS...

Many modern craftsmen practice the art of lapping and grinding with abrasive compounds. Clover sales prove it.

But we all need reminding, especially when new processes or products are being developed, that abrasive compounds often provide the most economical as well as the most accurate method of producing specified surfaces or shapes. Lapping or grinding with compounds offers many possibilities for tools and dies as well as for precision end-products. A check of available grains, vehicles, and methods before tooling up can be rewarding. Grains come in a full range of grit sizes, the viscosity of the vehicle is adapted to the required application, and the compound may be grease-mixed or water-soluble.

Ask your distributor, or write us, for suggestions on uses of Clover Lapping and Grinding Compounds.

Clover Manufacturing Company

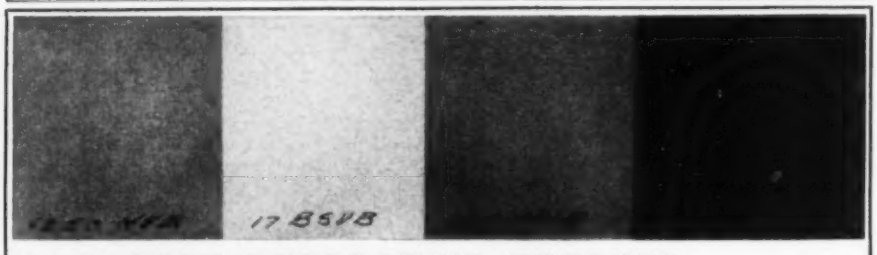
Norwalk, Connecticut

Victor 7-4515

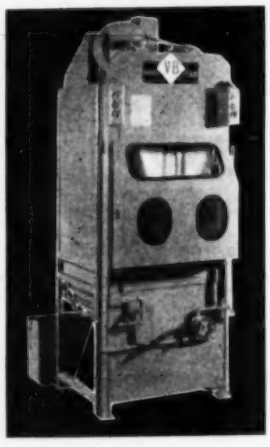
Since 1903

Makers of the Famous **CLOVER COATED ABRASIVES**

Use postpaid card. Circle No. 250



LOW COST DECORATIVE FINISHES Easily Applied With VAPOR BLAST EQUIPMENT



FOUR different decorative finishes on the strip of Stainless shown were applied in seconds with a Vapor Blast Liquid Honing* Machine. VAPOR BLAST decorative finishes are used on many products from eye glass frames to architectural extrusions to welding torches. They are applied easily, quickly and at low cost.

WRITE for a sample Stainless Strip and full information on how you can use Vapor Blast Machines to apply decorative finishes to your products profitably.

Representatives in Principal Cities

Vapor Blast is a Trade Mark • Liquid Honing is a Trade Mark

Model 3030 Vapor Blast Liquid Honing Machine

VAPOR V-B BLAST

VAPOR BLAST MFG. CO.

3126A WEST ATKINSON AVE.
MILWAUKEE 9, WISCONSIN

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SKF Promotions Announced

Thomas W. Morrison has been promoted to the position of director of engineering and research for SKF Industries, Inc., it has been announced by **E. R. Broden**, president.

In his new post, Morrison takes over active direction of the company's Engineering Division and Research Laboratory.

Both groups were under the direction of vice president **Gunnar Palmgren**, who is completing nearly 40 years of SKF service. Palmgren will continue as vice president and serve as special consultant to the president through the end of the year.

Frank E. Whyte has been named to the newly created position of Director of Purchasing for the SKF Industries, Inc., Philadelphia. He will direct and coordinate the ball and roll bearing manufacturer's Purchasing and Traffic Dept. activities.

Richard I. Kern

T. W. Morrison

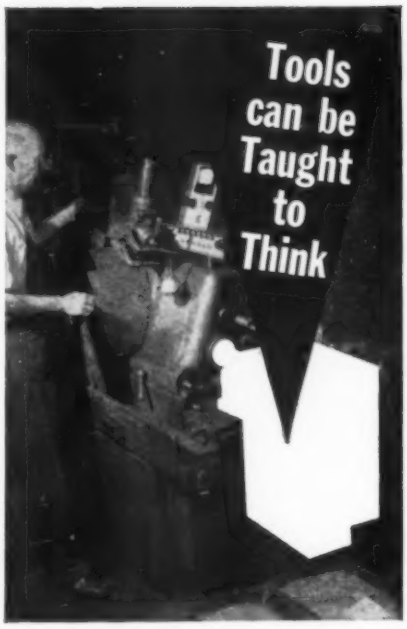
MPB Marketing Head

Richard I. Kern has been named vice president of marketing for Miniature Precision Bearings, Inc. according to an announcement by **Horace D. Gilbert**, president of the company. Kern was formerly general marketing manager for the corporation.

Fuller Merriam Expands Molding, Shipping Facilities

The Fuller Merriam Company, West Haven, Connecticut, has announced construction of two building additions, one to house the shipping department and one to provide new quarters for the mixing and pressing departments.

Space released in the present building will be used to increase productive capacity for firing and finishing vitrified products. Total expenditure for this expansion will total more than $100,000.



—prove it to yourself

*at Our Expense**

The INCHWORM® motor, replacing the lead screw on centerless grinders, completely eliminates backlash and gives tolerances to ± .000025".

Standard *MICROtrol*[1] 160 gaging and control components can be added to the INCHWORM for fully automatic centerless grinder operation. These reliable, fully proven, closed loop systems have enabled many leading producers of precision parts to achieve previously impossible tolerances at lower production costs.

for:

- ***Trial Offer**
- **Complete Data**
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1. (Trade Mark)

Contact your nearest Cutler-Hammer office or write direct to . . .

AIRBORNE INSTRUMENTS LABORATORY
1345 NEW YORK AVENUE
HUNTINGTON STATION, L. I., N. Y.
A DIVISION OF CUTLER-HAMMER, INC.

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GE Appointments

The appointment of **Walter P. Cartun** to the post of general manager of the General Electric Company's Miniature Lamp Department has been announced by **George E. Burnes**, vice president and general manager of the Lamp Division.

Cartun succeeds **Kenneth G. Reider**, who is retiring after 42 years service with GE. Reider, however, will remain with the department as consultant, according to Burnes.

C. W. Powell has been appointed manager, Southern District, for Metallurgical Products Department of the General Electric Company.

The firm's Southern District headquarters are in Atlanta, covering an area including all the southern states, parts of Kansas and Missouri, and Oklahoma, Texas and New Mexico.

Harry H. Jason has been named Manager-Atlantic District of the General Electric Co.'s Metallurgical Products Dept. Detroit. He will be located at 760 Colfax, Kenilworth, N.J. The Atlantic District covers all of New England, Del., Md., and the eastern portions of N.Y., Pa., and Va.

C. W. Powell

Jay C. Gorham

Bendix Industrial Controls Chooses Midwest Manager

Appointment of **Jay C. Gorham** as Midwest Regional Manager for the Industrial Controls Section, Bendix Aviation Corporation, Detroit, Michigan, has been announced by **Roy M. Nelson** Sales Manager.

Gorham will be located at the Bendix home office, 21820 Wyoming Ave., Detroit, Michigan, and will be in charge of sales of Bendix numerical control systems for machine tools in the Midwest area of the United States.

Firth Sterling Elects Two Directors

Two additional members have been added to the Board of Directors of Firth Sterling Inc., Pittsburgh, Pa. **James L. Lewis** of Rye, N.Y. and **R. K. Hopkins** (recently elected a Vice-President of Firth Sterling.

SEND FOR CATALOG G

NAME
TITLE
COMPANY
STREET
CITY/STATE

LOW COST WAY TO
CUT
GRINDING
COSTS

When you dress grinding wheels regularly you clean loaded pores, uncover fresh abrasive grains — GET NEW PERFORMANCE AGAIN AND AGAIN. Dressing makes every wheel more efficient. In the complete Desmond line there is a dresser to meet your requirement—at low cost. A typical Desmond-Huntington dresser* costs less than $3.00: replaceable cutter sets average 36c. Ask your Desmond distributor's advice.

The only complete line of grinding wheel dressers and cutters

Desmond
Desmond-Stephan Mfg. Co.
Urbana, Ohio

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● ACTUAL MANUFACTURERS OF RESINOID, METAL AND VITRIFIED DIAMOND WHEELS UP TO AND INCLUDING 20" DIAMETER

Call or write for literature today

TRADE MARK
THE P. L. KUZMICK CO. VERONA, N.J.

THE PAUL L. KUZMICK COMPANY
271-279 GROVE AVE.
VERONA, N.J.

● MANUFACTURERS OF RESINOID AND RUBBER BONDED WHEELS SERVING THE AIRCRAFT, CUTLERY AND STEEL FABRICATING INDUSTRIES.

Call or write for literature today

P K

PEKAY ABRASIVES, INC.
271 GROVE AVE.
VERONA, N.J.

Use postpaid card. Circle No. 254

Distributors . . .

Rivett Selects Western Distributor

Rivett Incorporated, Boston, Mass., has appointed Ray Bobbs Air-Draulics, Inc., 212 S. E. 12th Avenue, Portland, Oregon, as exclusive distributor in the states of Oregon and Washington for Rivett air and hydraulic valves, cylinders and power units.

Rivett Lathe & Grinder, Inc., Boston, Mass., has appointed **R. C. Neal Co., Inc.,** 76 Pearl St., Buffalo, N.Y., as exclusive distributor in Western New York for Rivett air and hydraulic valves, cylinders, and power units.

S. S. White Industrial Division announces the appointment, effective August 1, 1959, of **Weightman and Associates,** Burbank, California, as exclusive representatives in the states of Arizona and California for the S. S. White Industrial Airbrasive Unit.

Niles J. Brook, vice-president of the **J. T. Slocomb Company,** South Glastonbury, Conn., pioneer manufacturers of micrometers and industrial measuring devices recently announced the appointment of **The Keefer Tool & Supply Company,** 383 Phillips Avenue, Toledo, Ohio, and of **The White Tool & Supply Company,** 1235-1239 West Sixth Street, Cleveland 13, Ohio as Selected Distributors of the J. T. Slocomb line of micrometers and industrial measuring instruments.

R. J. McComb Associates have been appointed sales representatives for **Pressure Blast Mfg. Co., Inc.,** Manchester, Connecticut, covering a sales territory which includes Connecticut, metropolitan New York and northern New Jersey. Products to be handled are the company's line of Pressure Blast units and abrasives.

Hydra-Blast Manufacturing Div., Automation Services, Inc., Detroit, has appointed **General Supply & Equipment Co.,** 15583 Brookpark Rd., Cleveland 11, as distributor for Hydra-Blast equipment and products. Appointed to cover the New England states was the **Waldron Co., Inc.,** North Haven, Conn.

For increased output and accuracy, finish your tools and gages with HYPREZ DIAMOND COMPOUNDS

Virgin Diamond particles, graded in our own laboratories, are uniformly dispersed in the exclusive Hyprez vehicle for maximum cutting action. They produce finer results faster on every finishing job... Your nearby Hyprez distributor will help you solve any lapping or polishing problem that may arise.

Write for free demonstration or technical bulletin No. HG-109

HYPREZ DIVISION
ENGIS EQUIPMENT CO.
431 S. Dearborn St., Chicago 5, Illinois

Use postpaid card. Circle No. 255

Norton Research Head Retires

Dr. Lowell H. Milligan, associate director of research and development at Norton Company, recently retired after 36 years with the company.

Among his inventions are the vitrified-bonded diamond grinding wheel and the first commercial white aluminum oxide grinding wheels introduced to industry. From 1941 to 1958 he was in charge of ceramic research on abrasive products and refractories.

L. H. Milligan

Sterling Appoints Detroit Abrasive Engineer

J. D. (Doug) Turnbull has been named as an abrasive engineer in the Detroit, Michigan, area, according to an announcement by **G. E. Fraley**, sales service manager for Sterling Grinding Wheel Company.

J. D. Turnbull

Torit Collectors Keep New Plant Dust-Free

Cyclone separator dust collectors, manufactured by **Torit Manufacturing** Co. are helping to keep the new modern facilities of Parker White Metal Company free of dust. Parker White Metal recently moved into a new one-floor plant in Fairview, Pa., just west of Erie.

The new Grind-A-Matic is an air turbine grinding head which can be mounted either vertically or horizontally on almost any machine tool.

Its versatile application and high precision performance allow Grind-A-Matic to perform grinding operations normally done on an expensive jig grinder. Mounted the same as any standard tool, it becomes a close tolerance grinder for such work as internal grinding of tools, dies and fixtures.

Threadwell

GRIND-A-MATIC

provides jig grinder performance at drill press prices

- *Fine radial adjustment from "0" to .070" while the spindle is rotating.*
- *Uninterrupted precision grinding*
- *Coarse adjustment from "0" through 1¼"*
- *Spindle speeds from 50 to 75,000 RPM*
- *Standard range from ⅛" to 2½" holes*
- *Adapted to include holes up to 5½"*
- *Sealed air turbine and spindle bearings*

Threadwell

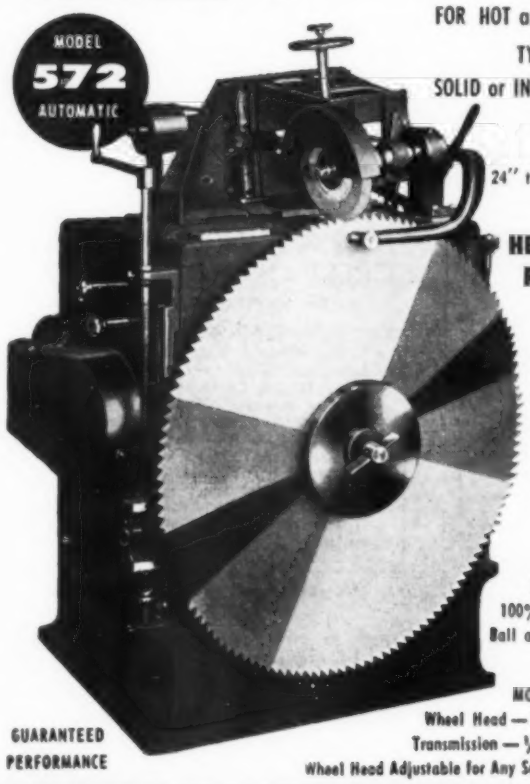
THREADWELL TAP & DIE CO.
Greenfield, Mass.

Use postpaid card. Circle No. 257

HANCHETT METAL SAW SHARPENER

FOR HOT and COLD SAWS
TYPES
SOLID or INSERTED TOOTH

MODEL 572 AUTOMATIC



CAPACITY
24" to 72" and Larger

HEAVY DUTY
POWERFULL
SMOOTH
ACCURATE

DEALER INQUIRIES INVITED

BEARINGS
100% Anti-Friction
Ball and Roller Types

MOTORS
Wheel Head — 2 H.P. — 1800
Transmission — ½ H.P. — 1200
Wheel Head Adjustable for Any Saw Tooth Angle

GUARANTEED PERFORMANCE

HANCHETT MANUFACTURING COMPANY
Main Plant
BIG RAPIDS, MICH.
West Coast
PORTLAND 1, ORE.

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It takes 30 years to save you minutes!

Abrasive Belt attachment for Airetool horizontal grinders. Ideal for fine finishing dies, molds, seam welds, any contour surface.

Airetool has been making pneumatic tools for 30 years. During that time we have developed a number of new innovations in construction and design that make Airetool equipment the most efficient you can use. That's why Airetool's Model 700 horizontal grinder, above, and Model 500 horizontal die grinder help you get more production and better results than other similar tools. Write us for demonstration or Catalog No. 67.

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MANUFACTURING COMPANY
SPRINGFIELD, OHIO

OFFICES AND REPRESENTATIVES in principal cities of U. S. A., Canada, Mexico, Puerto Rico, South America, Europe, Italy, England, Japan, Hawaii.

CANADIAN PLANT: 37 Spalding Drive, Brantford, Ontario
EUROPEAN PLANT: Vlaardingen, The Netherlands

Use postpaid card. Circle No. 258

NEWS OF INDUSTRY *continued*

Timken to Double Columbus Railroad Bearing Production

The Timken Roller Bearing Company will build a new railroad bearing facility in its Columbus railroad bearing plant at a cost of $5,250,000, according to an announcement by **A. L. Bergstrom,** vice president of engineering.

The new unit will duplicate the capacity of the present production line, bringing the total output of the plant to over 40,000 car sets a year.

Equipment for the new facility will be ordered immediately. By the fall of 1960, it is estimated, the new line will be in operation.

MIT Professor Conducts Study On History of Technology

A $35,000 grant by the Wilkie Foundation of Des Plaines, Ill., for a pioneer study on the history of technology, was announced by the Massachusetts Institute of Technology, Cambridge, Mass.

Robert S. Woodbury, Associate Professor of the history of technology in the Department of Humanities at M.I.T., will conduct the study. He said the purpose is to show the development and implications in industry of machine tools. Professor Woodbury has a background of writing for economic historians and the tool industry. He has also been serving as a consultant to the DoAll Co. in the preparation of their Hall of Progress, a permanent exhibition of technological history which was opened June 11 in Des Plaines.

Bals Promoted to GM of Aurora Pump

The appointment of **John M. Bals** as general manager of Aurora Pump Division, The New York Air Brake Company, has been announced by **C. T. Zaoral,** president of the parent concern. Mr. Bals succeeds **Frank S. Main,** who relinquishes the post due to health.

Mr. Main, with over forty years in the field, will continue to serve the company in an advisory capacity.

F. S. Main

J. M. Bals

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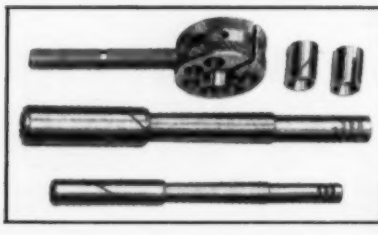

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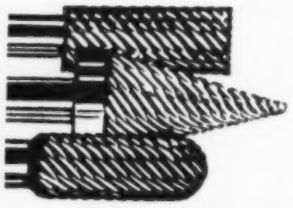

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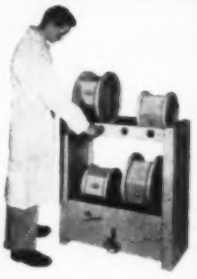

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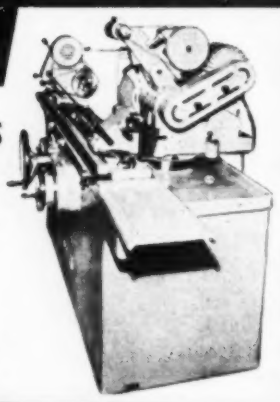

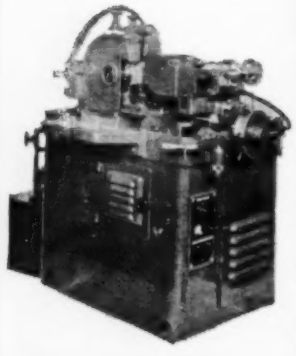

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GRINDING and FINISHING

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The advent of the small cars provide some new problems and also allow for introduction of new procedures.

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46 How to Apply Safety to Portable Grinding
The application of both general and specific provisions of the Safety Code to portable grinders.

52 Unit Dust Collection Saves Swarf
Adequate equipment will save some of the dollars that can go up the dust collector in diamond swarf.

53 Home-Made Rig Automates Sanding
Bolt a belt sanding attachment side-saddle on a lathe, add a few control gadgets. Presto! Automatic sanding—plus the original second lathe available for other work.

Coming Next Month

Anti-friction Bearing Grinding at International Harvester

Both roller and ball bearings are manufactured at the West Pullman Works. These two products are almost entirely ground from the rough. Many of the parts of each run on the same machines in job lot quantities.

The How and Why of Gaging—Part IV

The "gee-whizzery" of automatic gaging and control for both in-process and post-process applications, plus optical and sonic gaging. List of brochures, pamphlets and other literature available from manufacturers on the subject.

Barrel Finishing Hard To Get Areas

Vibration of barrels greatly increase the advantages of this method of finishing by deburring and finishing areas inside castings which formerly had to be done by hand.

Economy in Buffing and Polishing . . . A Water Pitcher

Six major finishing operations are required to produce a quality silver-plated water pitcher.

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When purchasing a REX SUPERVAN HIGH SPEED STEEL SPINDLE for your Crystal Lake Grinder an additional $50.00 to the purchase price will give you a TWO YEAR SPINDLE GUARANTEE.

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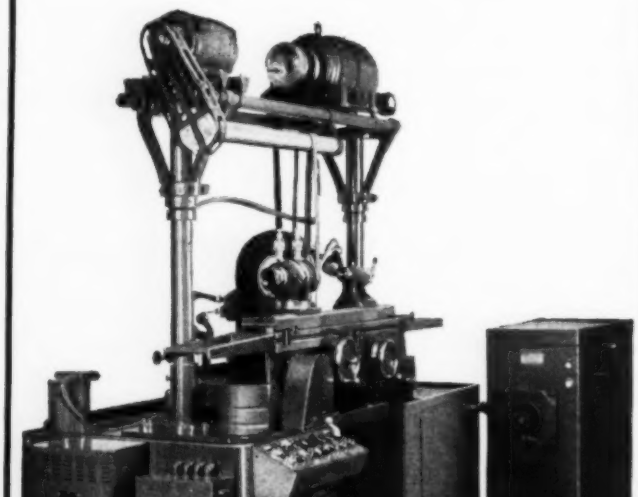
For example, fuel injectors, after having been rough ground, can be ground to .000010" roundness with a sixty grit wheel and one pass of the wheel.



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A Final Thought

"If They Can Make Satellites....."

You've heard about rockets and missiles and the wondrous technical advances which gave them birth until no one can blame you if you say, "Enough, enough, I don't make 'em. Got nothing to do with Sputniks, Mutniks and other nixes. When new developments trickle down to my level, I'll use them. Let me get back to work now. I'm in the hair dryer business."

This makes sense, but there is one consideration: hair dryers, as well as rockets, have to be manufactured in our space age. They have to be sold in our space age, not in yesterday's propeller age. Our thinking, our outlook, our very conceptions of government, economics, business, industry, sales and consumers are affected by this stampeding age, and it makes no difference whether you make hair dryers, toasters, frying pans, or eke out a haphazard living publishing magazines. Fellows, we've had it. Yesterday's plush days left with the B-17.

Today our products are more complex, have more automatic features. As a consequence three monsters raise their heads: higher costs to produce, more service to keep them in operation, a shorter life expectancy. In addition, the sales department wants still more automatic features, management wants higher production, and both insist on much, much lower costs . . . "and what's the matter with engineering and design that they can't give us what we want?"

If today you make toasters that pop up, tomorrow you'll have to make them so that they automatically butter the toast and spread the butter evenly. Sales insists on these developments to meet competition. Competition is already thinking of the day when they will smear on the jam, in a choice of four different flavors.

It all sounds silly, and possibly we've exaggerated, but basically it's true. Management says, "If they can launch a man-made planet, we can make a toaster that jams up the toast. Let's go." The consumer who is told he needs to replace all his appliances and gadgets and mechanized equipment from car to sump pump, expects tremendous improvements. Says he, "If they can launch a man-made planet, etc."

In business the effect of what may be termed a technological stampede has had many interesting repercussions. There's time only to mention one: specialization within engineering and production. You left college a well-rounded engineer, equipped to take your place in any corner of the engineering department. You knew everything and could do everything. Today, alas, you need five heads to keep up with only metallurgy, to say nothing of instrumentation, hydraulics, electronics, and the huge field of grinding and finishing. We of the publishing business are in the same predicament. No one magazine can keep abreast of all that's happening in industry and technology. With increased speed of technical changes come the inevitable complexities requiring specialized knowledge. 'Tis the age of the sharp point rather than the blunt instrument, of the specialist of brain power, not manpower.

Wm. J. Schleicher

Vice President & Editorial Director

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will SAVE you TIME, TROUBLE and MONEY on your Production Coating Requirements.

MODEL G top quality, heavy production coater. Vernier adjustments, hinged roll construction.

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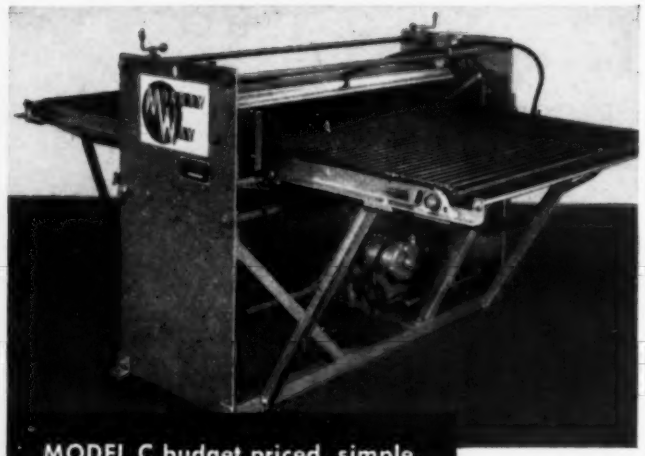

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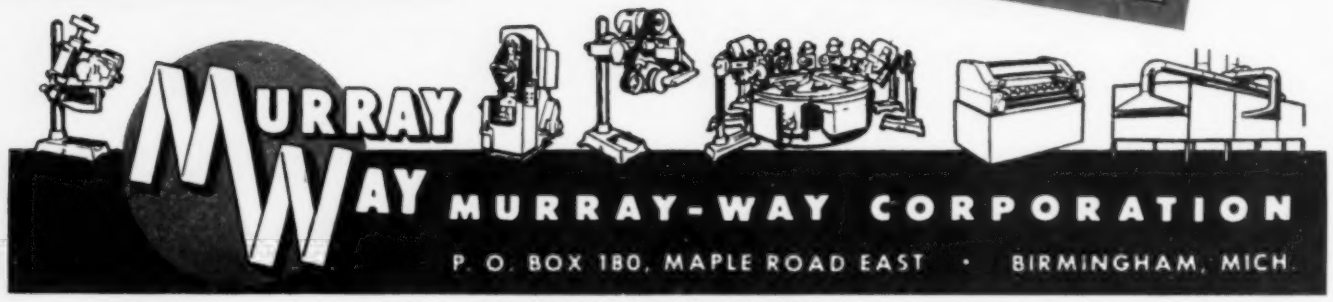

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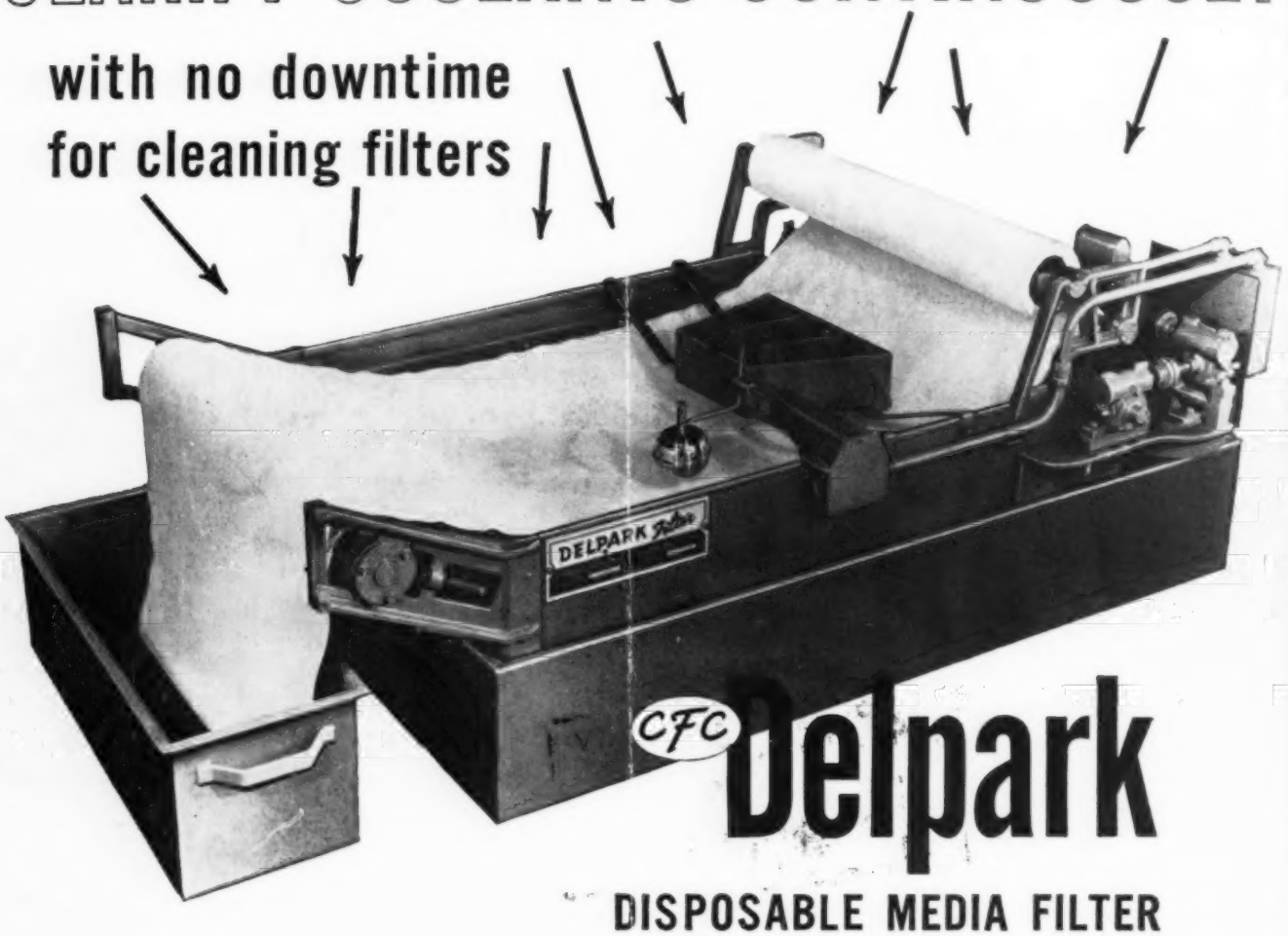

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The CFC Delpark Disposable Media Filter is self-cleaning . . . automatically. Full flow filtration of coolants is uninterrupted during the cleaning cycle. There's no costly downtime for cleaning the filters or reservoirs.

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The filter material, fed from a roll, rests on a flat endless conveyor. Dirty coolant is fed on to the filter material. Clean liquid passes through by gravity while solid contaminants remain on surface of filter material. When flow rate is reduced sufficiently, liquid level rises raising a float. This actuates a switch which causes conveyor to carry filter material and swarf forward, and bring a new clean filter surface under the incoming dirty coolant. Cycle is repeated automatically as necessary.

The CFC Delpark Disposable Media Filter is also designed for cutting oils, quenching oils and other liquids of light viscosity. Standard units have capacity of 2 to 700 gpm. *Write for technical literature to Dep't GF .*

COMMERCIAL FILTERS CORPORATION
MELROSE 76, MASSACHUSETTS
PLANTS IN MELROSE, MASSACHUSETTS AND LEBANON, INDIANA

MICRO-CLARITY AT MINIMUM COST

Fulflo FILTERS — *with genuine Honeycomb Filter Tubes for controlled micro-clarity of industrial fluids.*

CFC FILTERS — *Selective filtration of oils • water-oil separators • magnetic separators • pre-coat filters • coolant clarifiers • automatic tubular conveyors.*

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